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REPORT OF THE A. I. E. E. STANDARDIZATION COMMITTEE.

The Committee on Standardization of the American Institute of Electrical Engineers, after having worked for several months on the Standardization Rules with a view to bringing them up to date, has recently reported them in provisional form for criticisms or suggestions. The secretary of the Institute has issued copies of the report in galley-proof form to about seventy members of the Institute, and has invited suggestions thereon. A circular letter accompanying the proofs intimates that the committee desires to report the rules to the Institute at an early date. The matter contained in the provisional report now extends to 21 printed pages. Not only have amendments been made throughout the rules, in accordance with the results of latterday experience, but new matter has also been introduced, under the headings of Wave-Shape, Rheostat, Lightning-Arresters, Switchboard-Apparatus and General Recommendations. The committee has also indicated its desire to reclassify the substance of the rules. In their original form, when adopted by the Institute in 1899, the rules were classified according to a plan that then seemed convenient and desirable. At that time the report only extended over 13 printed pages. Additions were made from time to time by the committee, and these additions were naturally incorporated along the original lines of classification. The additions have finally become as comprehensive as to overwhelm the original substance in various directions, with the result that a new classification, according to a somewhat different plan, is now admitted to be desirable. The committee doubtless realized that this would be a somewhat lengthy undertaking, and decided to issue the substance of the rules for criticism prior to reporting to the Institute, so as to leave the reclassification to a later date.

An important amendment is offered in regard to the efficiency of large generators. Heretofore large generators have usually been tested in the factory while running on temporary bearings because the driving engines and permanent bearings were only set up in the central station. The result was that the mechanical journal friction of the alternator during the test for acceptance at the factory was perhaps very different from the journal friction of the same machine when ultimately installed. Consequently the journal friction in the factory test was omitted from consideration, thus slightly improving the generator efficiency, and leaving the generator journal friction as a fixed charge upon the prime mover. The introduction of the turbo-generator, however, has permitted the engine and generator to be tested together in the factory as a single unit. It is now proposed that the frictions of the unit be determined by measuring the retardation, or the time of coming to rest, after the stream has been entirely shut off; a vacuum connected to the turbine, and the speed first brought up to the full normal value. Half of the friction thus arrived at is then charged to the generator and half to the engine.

Another new proposal, which is of considerable importance to

designers refers to the wave-shape of alternating impressed e.m.f. A standard alternating e.m.f. is now stated to be sinusoidal in wave form, and no wave is to depart from this standard form by more than 10 per cent, unless specially stated. The deviation from the standard form is measured by obtaining a record of the wave, to rectangular co-ordinates, by oscillograph, and superposing thereon a sinusoidal wave of the same length and same effective value. The maximum difference between the ordinates of the two waves, at any abscissa divided by the amplitude, or maximum value, of the sinusoidal wave, constitutes the numerical value of the deviation. Lightning arresters and static protectors are stand-deviation. Lightning arresters and static protectors are standardized in regard to their capabilities under laboratory test. This is the first time that such devices have been placed in the rules. It is important that any comments or criticisms upon the proposals of the committee should be reported by the members as soon as possible, in order to aid the committee in drawing up a proper report to the Institute.

The Trenton Falls Power Plant.

It is seldom that one finds in the East a hydraulic situation presenting so many points of interest as that found at Trenton Falls, the electrical development of which we describe elsewhere. To begin with, it is a case of mid-head, in the debatable ground between turbines and impulse wheels. More than this, the situation required long pipe lines carrying large volumes of water with the accompanying difficulties of regulation. The former situation was met by the construction of special vertical shaft turbines. The 264-ft. head made it relatively easy to adopt the sometimes clumsy vertical shaft generator, and thus considerably to economize space in the power house. The result is a very simple and convenient station. The second matter was more serious and some extreme measures had to be taken. Western precedents were followed and the main run from dam to power house was made with a 7-ft. wooden standpipe 2,900 ft. long. This type of conduit has been rarely used in the East within recent years, although a few old examples exist in New England. It is, however, cheap, reliable and durable for moderate inclines, and has been largely used on the Pacific Coast for many years. The lower end of the pipe is of steel graduated in thickness to meet the increasing pressure. Near the final plunge downward to the power house a standpipe 200 ft. in height and 7 ft. in diameter is inserted in the line to serve as a relief against sudden changes of flow. It is perhaps the most imposing structure of the sort yet erected, and renders possible a degree of regulation which could not otherwise have been obtained without added complications.

In addition relief valves are inserted in the line, but the standpipe is the main reliance against varying pressure. Most long pipe lines are used under conditions that permit the use of deflecting nozzles, and the use of turbines with quickly revolving gates rendered pressure control of extreme importance in this plant. The governing, under these conditions, should be good in spite of the great length of pipe line back of the wheels. The general design of the power house strikes one as excellent. It is very compact, owing to the form of the generating units, and the transformers and switchboard panels are where they can be cared for with the minimum of trouble, i. e., on the main floor at the end of the station from which the wires emerge. The lightning arresters are also where they should be, in a house by themselves adjacent to the station proper. It would be hard to find a station of equal capacity more conveniently arranged for easy operation. The transmission lines present no remarkable features, the distances involved being relatively short. It is an admirable example of intelligent use of nearby resources, and when the subsidiary plants are equipped the system will rank in output among the larger plants of the East. There are still many quite unutilized water powers which can be made similarly valuable. Most of them, to be sure, are further from a market than is Trenton Falls, but in these days of high-voltage work much longer transmissions than this can be made highly economical. And the fear of operating in parallel has now departed, so that there need be no hesitation in linking together as many plants as may be necessary to secure the required output. In fact, it is a common observation that a group of plants often work more smoothly than a single station, helping each other out and cushioning the effects of sudden changes of load. And other things being equal, a network gives more reliable service than can be obtained from a single plant, and it often affords a lower total cost of distribution on account of the decrease in the necessary line precautions.

Special Lighting of Business Streets.

There is at present in a number of cities in this country a movement to establish plans for the lighting of certain down-town business streets which will result in rendering such streets much more attractive at night than is the ordinary business street. The plan is one which not only interests central station companies that are awake to all opportunities, but is of equal interest to merchants and citizens who desire to see their respective cities classed among the attractive and the progressive. Such special down-town street lighting is by no means new, but the interest in such plans has never before been as widespread as it is now. The principal business street of Columbus, O., with its arches of incandescent lamps, has been a pleasing example of such special lighting for many years. Euclid Avenue, Cleveland, with arc lamps on ornamented posts every 50 ft. as well as some other streets similarly lighted in Cleveland are good examples in the arc lighting line. More recently Los Angeles has adopted for its business streets lighting by incandescent lamps in clusters on posts at frequent intervals, as described in a paper read last week by Messrs. Underwood and Lansingh before the Illuminating Engineering Society, as abstracted in this issue, and a similar scheme is being tried on Michigan Boulevard, Chicago. Arc lighting with posts 25 ft. apart has been begun in Minneapolis, while the business men of St. Paul are about to unite on an incandescent post-lighting plan. Less pretentious plans are being promoted in smaller towns. One village has a row of incandescent lamps over each sidewalk in certain streets, which is an inexpensive way of adding considerably to the attractiveness of a street.

These plans for special down-town street lighting are usually taken up first by some merchants' association or chamber of commerce. To be effective not less than an entire block of such lighting should be secured in a place, and preferably much more than this. It is sometimes possible to secure an unbroken stretch of such lighting by dealing with each merchant or property owner individually, but there are always likely to be breaks in the chain under such a plan. As to the relative merits of arc and incandescent lighting for this work, we are not disposed to take sides. Arc lighting produces an effect nearer to daylight. In-

candescent lighting looks more festive—almost too festive and temporary, some think; but with good diffusing globes and substantial post design, the incandescent lighting can be given an appearance of stability and permanency equal to arc lighting. The problem of selecting the lighting equipment for business streets, therefore, settles down mainly to a question of color and quantity, which are so largely matters of personal taste.

THE PROPERTIES OF ELECTRICALLY PREPARED COLLOIDAL SOLUTIONS.

The April number of the *Philosophical Magazine* contains an article by Mr. E. F. Burton on the properties of electrically-prepared colloidal solutions, which subject has a special interest at the present time in connection with the Austrian "colloidal filament" lamp, for which, as has previously been noted in these columns, great claims of efficiency are made. The term colloidal seems to be fashionable at present among physicists, and to be somewhat ill-adapted to the expression of the numerous properties that it now covers. Not long ago substances were divided into two classes, namely: crystalloids and colloids. Crystalloids include mineral acids and salts, can usually be obtained in definite crystalline forms, and when dissolved in water materially affect the physical properties of the water. Colloids are amorphous or non-crystalline substances. When dissolved in water they appear to be mechanically suspended therein in finely divided form. Common salt and sugar are typical examples of crystalloids. Jelly and gum arabic are typical colloids. A colloidal solution of a metal is a solution in which the metallic particles lie suspended in a very finely divided state, as distinguished from a metal in the condition of a dissolved salt, such as copper sulphate. An electrically-prepared colloid solution of a metal may be made by allowing an arc to form under water between electrodes of the metal under consideration. After such arcing the electrodes lose a small amount of weight, and the water becomes cloudy. This cloudy water may be filtered again and again without appreciably altering its color or translucency. It may remain for months unchanged. It contains suspended metallic particles of ultramicroscopic smallness. It is a colloidal solution of the metal.

The paper shows that the diameter of the metallic particles in colloidal solutions of platinum, gold and silver in water varies between 0.2 μ and 0.6 μ. No microscope can permit an image to be formed of an object smaller than one micron in diameter (1 μ) because the wave lengths of light are too short, being comprised between 0.4 μ and 0.8 μ, and light cannot form an image of a particle that is not large by comparison with its wave length. Nevertheless, the presence of such particles may be rendered evident by the ultra-microscope, an instrument which can reveal the light scattered by a particle, when the particle is too small to form an image. A silver solution containing 0.68 milligramme of metal per litre revealed the presence of 3,000 particles of metal per cubic millimetre of solution, with the aid of the ultra-microscope. In the field of this instrument each particle appeared like a faintly bright moving star. Each particle was in constant zig-zag motion. The direction and velocity of the motion of any one particle constantly changed. This Brownian motion, as it is called, is generally admitted to be a consequence of the kinetic theory of gases and liquids, when the particle viewed is so small that the impacts of its neighbors from opposite directions do not balance, but leave a residual momentum that is constantly being altered by successive collisions. The most interesting electrical property of these ultra-microscopic particles is that they all persistently carry an individual electric charge. The electro-negative non-oxidizable metals, gold, silver and platinum, in water, are negatively charged. The electro-positive oxidizable metals, on the contrary, give solutions in water, ethyl alcohol and methyl alcohol, in which the particles are always positively charged. That is to say, colloidal metallic particles, which are much larger than the atoms, retain in their aggregation the atomic sign of the electric charge.

THE TUNGSTEN INCANDESCENT LAMP.

A number of attempts have been made recently, as is well known, to improve the light-yield of incandescent lamps, by the selection of a suitable high-melting-point metal for the filament, in place of carbon. A considerable degree of success has been met with in the use of graphite, tantalum and osmium. It seems to be only a question of time and commercial process development when the ordinary carbon filament, now so widely used, shall disappear. Reports have recently come to hand concerning attempts to utilize two new elementary substances; namely, molybdenum and tungsten, particularly the latter. Tungsten is a rare metal, has an iron grey color and is so very hard that it can scratch glass. Its specific gravity is given as 19.1, and its atomic weight 184 (almost identical with tantalum), thus being one of the heaviest of metals. It was discovered by Scheele in 1780. It is sometimes called wolfram, particularly in Germany, but this term is also applied to a mineral consisting of a double tungstate of iron and manganese. Until recently, tungsten has only been known to most electricians as the metal which, when added to German silver to the extent of one or two per cent, produced the alloy platinoid, which possesses a remarkably high resistivity, the value of which varies only slightly with great temperature changes.

Like osmium and tantalum, tungsten has a lower resistivity than carbon, and consequently there is the same kind of difficulty in producing high-voltage lamps of tungsten that there is in producing high-voltage lamps of osmium and tantalum. Nevertheless, 110-volt tungsten tantalum lamps of 32-cp are stated to have been produced. A very high efficiency, and therefore a very low specific consumption, is claimed for them, namely, 1 watt per hefner, or .88 candle, while the lifetime at this specific consumption is reported as 1,500 hours. Moreover, it is said that the candle-power of the tungsten lamp remains constant during its lifetime and that it is not sensitive to fluctuations in terminal voltage. If all this is borne out in practice, and the lamp can also be produced at a reasonable cost, a very roseate future should be predicted for it. Up to the present time, however, the information offered is too meagre to admit of any reliable opinion being formed as to the merits of the tungsten filament. It is unquestioned, however, that its melting point is exceedingly high. In fact, according to the inventors in Austria, pure tungsten does not melt, but volatilizes directly at a temperature considerably in excess of that at which the ordinary carbon filament is supposed to volatilize. On this account a considerable improvement in the luminous efficiency of tungsten as compared with carbon filaments when employed in incandescent electric lamps may reasonably be expected.

A. I. E. E. Election.

The vote for president and officers of the American Institute of Electrical Engineers for the year 1906-7 was declared at the annual meeting, New York City, on May 15 as follows: Dr. S. Sheldon, president, 1,257 votes. Vice-presidents—A. H. Armstrong, 2,051; H. H. Humphrey, 2,020; F. G. Baum, 1,942. Managers—Paul Spencer, 2,077; Paul M. Lincoln, 2,089; John J. Carty, 2,060; A. M. Schoen, 1,903. Treasurer—G. A. Hamilton, 2,176. Secretary—R. W. Pope, 2,177. Mr. E. W. Rice, Jr., for president, received 907 votes.

The proposed new constitution failed to receive the necessary number of votes to make it effective.

Organization of Chicago Section of the Illuminating Engineering Society.

At a meeting held on the evening of May 7, at which about 65 were present, the Chicago section of the Illuminating Engineering Society was organized. The Chicago section starts with nearly 50 members and applicants for membership. Temporary officers were elected as follows:

President, Mr. George C. Keech; secretary, Mr. J. R. Cravath; managers, Messrs. J. F. Gilchrist, R. E. Heine, J. M. Morehead and Charles E. Ummach.

A paper was read on "Residence Lighting," by J. R. Cravath. This was illustrated with stereopticon views from photographs of various rooms with different lighting arrangements. Mr. Cravath explained at the beginning that the object of the paper was to lead to a discussion on some of the common questions which came up in residence lighting, that it would not be possible in the limits of one evening's paper to take up the subject of residence lighting either thoroughly or systematically, and that this subject had been taken up at some length recently in a series of articles by Mr. V. R. Lansingh and himself. The points made by Mr. Cravath in his paper being very similar to those made in the articles referred to, it will not be necessary to publish an abstract here.

Mr. John F. Gilchrist, in the discussion of this paper, said that one of the principal things it brought to mind is the great lack of properly designed fixtures. Fixtures are now made without any idea of the lighting effect to be produced, but simply for ornament. He thought we might be now at about the same stage in illumination that furniture making was at the time when William Morris began to teach the world that furniture could be at the same time comfortable, useful and artistic.

Mr. O. J. Bushnell said that the man who owned his own home could arrange electric light fixtures to suit himself, but the one who suffered most from poor illumination was the man in rented quarters. He had recently moved into a new apartment where one or two of the rooms had lighting well designed in accordance with the principles laid down by Mr. Cravath. In the kitchen, however, no electric lamp whatever had been provided. Upon commenting on this to the landlord, he was told that it was a common thing for Chicago architects to omit electric lamps in the kitchens of flats and apartment houses.

Mr. Cravath said that he considered the kitchen should as a rule have the best general illumination of any room in the house, because it is a work room requiring good light in a number of places. In other rooms in the house it is usually necessary to provide illumination in only one or two places, as for example for reading in the living room and at the dresser or over the bed in a bedroom. In the kitchen there must be a good light over the entire room.

Prof. P. B. Woodworth told his experience in designing the illumination of some 40 residence and apartment houses. In the residences there was no great difficulty in providing satisfactory arrangements to suit the owners, as the requirements were fairly uniform. In eight different apartments, however, there were as many different ideas as to the uses to which the various rooms were to be put, and consequently no lighting arrangements suited to one apartment could be duplicated in another. In the lighting of small bedrooms where only one outlet is available, the only way out of the difficulty seemed to be the use of a portable bracket which could be hung on the wall in various parts of the room where it was needed.

Mr. Cravath endorsed what Prof. Woodworth said about the usefulness of the portable wall bracket in bedroom lighting, and also called attention to the small number of satisfactory portable wall brackets to be found on the market at present.

Mr. S. M. Bushnell said that there is a tendency now away from the old idea of keeping down expenses as much as possible with electric lights, since the cost to the consumer is being constantly reduced. It will be the province of such an organization as this to arouse demand for better illuminating arrangements. In the old days it was difficult to get a hotel keeper to consent to more than one outlet in each bedroom, but times are now changing. There is a constant increase in the amount of light that is being used both for useful and display work.

Competitive Telephony in New York City.

The struggle of the Atlantic Telephone Company to secure a franchise to give service in New York City culminated last week in hearings on the subject before the Board of Estimate. The company was represented by Mr. M. W. Littleton. The opposing Bell interests were represented chiefly by ex-Comptroller Grout and Mr. John G. Milburn. There were warm arguments on both sides. The Merchants' Association of New York filed a letter against the proposed grant, on the ground that two telephone systems were unnecessary. The New York Telephone Company had definitely and explicitly committed itself to the regulation of its charges by the limitation of its earnings, to complete publicity of its affairs and to a supervision of its accounts by public authority. The association urges, therefore, that the telephone business be continued as a monopoly, subject to municipal regulation.

The first basis of arrangement proposed by the Atlantic Company with the city was a payment of about $3,000,000 for a 25-year franchise, and free telephones for the city. The latest offer, made more or less informally, is that if the Board of Estimate and Apportionment would give the company for 25 years what the city has given the New York Telephone Company for the last 25 years in the way of a monopoly of the ducts of the Empire City Subway Company, and about $300,000 a year, the equivalent of the city's telephone outlay, his company would give the city the use of 1,000 telephones without cost, and would guarantee a rate of only two cents a message, or $12 a year for 600 messages. A three-fourths vote of the board is necessary for the granting of any new franchise, and it is doubted in some quarters whether this can be secured. The Atlantic Company proposes to use the system of the Automatic Electric Company, of Chicago, already well known to our readers. Some three or four other competitive companies are seeking a franchise.

The Diversion of Water from Niagara.

President Roosevelt has sent to Congress the report of the International Waterways Commission on the preservation of Niagara Falls. In addition to suggesting that the amount of water to be diverted be limited either by treaty or by legislation, the commission recorded the following recommendations:

First, in the opinion of the commission it would be a sacrilege to destroy the scenic effect of Niagara Falls.

Second, while the commission are not fully agreed as to the effect of diversions of water from Niagara Falls, all are of the opinion that more than 36,000 cu. ft. a second on the Canadian side of the Niagara River or on the Niagara Peninsula, and 18,500 cu. ft. a second on the American side of the Niagara River, including diversions for power purposes on the Erie Canal, cannot be diverted without injury to Niagara Falls as a whole.

Third, the commission, therefore, recommends that such diversions, exclusive of water required for domestic use or the service of locks in navigation canals, be limited on the Canadian

side to 36,000 cu. ft. a second, and on the United States side to 18,500 cu. ft. a second, and in addition thereto a diversion for sanitary purposes not to exceed 10,000 cu. ft. a second be authorized for the Chicago drainage canal, and that a treaty or legislation be had limiting the diversions to these quantities.

The Canadian section, while assenting to the above conclusion, did so upon the understanding that in connection therewith should be expressed their view that any treaty or arrangement as to the preservation of Niagara Falls should be limited to the term of twenty-five years, and should also establish the principles applicable to all diversions or uses of waters adjacent to the international boundary and of all streams which flow across it.

The Distribution of Energy from Niagara Throughout Ontario.

Early in the present year the Lieutenant-Governor of Ontario appointed a hydro-electric power commission to obtain information from various sources concerning the demand for electric power throughout the Niagara district of the Province of Ontario to investigate the undeveloped water powers in that district, to ascertain the rates which should be charged for electric service and to determine the cost of the hydraulic undertakings of existing companies. Using the reports of the commission as a basis for his estimates, the Hon. Adam Beck, chairman of the hydro-electric commission, has introduced in the Legislature a bill which would empower the commission to act as the arbiter of prices for electric service. According to the provisions of the bill, the Government will appoint a permanent commission to oversee the relations between the existing power companies and the municipalities. This body will be empowered to fix the rates at which electricity shall be sold in the various portions of the province, and may, with the consent of the Crown, expropriate privileges already granted to private companies. The province will borrow money to be expended by the commission on the construction of transmission lines and distributing plants. Municipalities desiring to participate in the plan may enter into contracts with the commissioners for the supply of electricity at rates which will include an allowance for transmission and transformer losses. The municipalities will eventually bear all the cost of the works. They will pay four per cent interest on the expenditure and an annual sum sufficient to form in thirty years a fund for the retirement of the securities issued to cover the cost. Lastly, they will contribute to the expenses of maintaining, renewing and insuring the works installed. Complaints that excessive rates are being charged for energy, or that municipalities are discriminating in favor of certain manufacturers, may be heard by the commissioners, who may direct what rates are to be paid.

Theses by Senior Electrical Engineers, University of Minnesota.

Following is a list of the theses by members of the graduating class of the University of Minnesota:

Messrs. Albrecht and Weber are completing a set of condensers which will be used in connection with a Braun tube for investigating the wave forms of high-frequency high-potential oscillating discharges. Mr. Bunce is making an electrolytic survey to determine the effect of street-railway currents upon underground cables and other conductors. Messrs. Calmeyer and Cohen are investigating electrolytic condensers. Messrs. Cooper and Hubbard are investigating the mercury vapor rectifier for obtaining direct current from alternating current. Messrs. Cornelius and Stenger are investigating the wave forms of electromotive force by means of a Duddell oscillograph, at the power station of the Twin City Rapid Transit Co. Messrs. Dunn and Schwedes are developing a new device for making automatic arc lamps suitable for operation on either alternating or direct-current circuits. Messrs. Englin, Roepke, Underman and Haeberle have set up an apparatus in the Northeast Pumping Station for removing bacteria and discolorations from the Minneapolis city water supply. This will be placed in operation as soon as certain repairs at the pumping station are completed. Messrs. Finchy and Shuck have completed an improvement upon the flicker photometer and are investigating the performance of flaming arc lamps.

Messrs. Glascock and Stone are testing and redesigning the electric light plant at Le Roy, Minn. Messrs. Gunther, Schow and Wiggins are investigating apparatus for lighting railway trains from the car axle. Messrs. Hoff, Lang, Mowry and Payne have nearly completed a new recording instrument by which simultaneous and continuous records may be made showing variations of the current, voltage and speed of an electric car; when this is completed they will test one of the Minnetonka cars. Messrs. Hokanson and Zimmer are investigating the relative values of different kinds of artificial light for photographic and photo-engraving purposes. Mr. Glascock is working upon a sectional transformer which will provide for 2,000 amperes alternating current for calibrating, testing and welding purposes. Mr. Kaufmann is remodeling a General Electric three-phase motor for use as a variable speed motor and frequency changer.

Municipal League Convention at Atlantic City.

The twelfth annual meeting of the National Municipal League was held at Atlantic City, N. J., in conjunction with the fourteenth national conference for good city government, April 24-27, under the presidency of Hon. Charles J. Bonaparte, of Baltimore, now secretary of the United States Navy. A large amount of interesting and valuable material was presented in the shape of papers and discussions. The subject of uniform municipal accounting was dealt with by Mr. L. G. Powers, of the United States Census Bureau, and Ohio's experience with uniform accounting and reporting by A. B. Peckinpaugh, of the State Auditors' Department, Columbus, O. The session of Friday, April 27, was devoted to the general subject of municipal ownership and operation in American cities, when a number of papers and reports were presented, chiefly by title. Data were given as to Logansport, Ind.; Jacksonville, Fla.; Detroit, Mich.; Duluth, Minn.; Lincoln, Neb., etc., claiming great economies in public lighting service from municipal plants, all the figures being, however, of the familiar character. Mr. F. F. Ingram, president of the Public Lighting Commission of Detroit, made in his report the extraordinary statement that "legal expenses" on the part of private corporations were virtually a cover only for bribery and corruption. An interesting comparison and discussion of conditions abroad—particularly in Germany—and in the United States, was given by Prof. L. S. Rowe, of the University of Pennsylvania, based upon his own observations abroad, and admitting that in most American cities the municipal plant is an impossibility. "It is both an interesting and significant fact that the same combination of causes is everywhere apparent, but particularly evident in Germany. The movement for municipal ownership of gas and electric lighting, and particularly of street railways, is directly traceable to the failure of private companies to furnish the kind of service which the inhabitants of the cities demand and have the right to expect.

"The indictment against the public service corporations in Germany and to a lesser extent in Great Britain is none too strong. Whatever lessons may be drawn from foreign experience—and they are numerous and important—no one will contend that this experience can do more than throw an interesting sidelight on the problems that confront our American cities. We must recognize in the first place that the attitude of the American people toward the city is totally different from that which prevails in the countries of Europe. With us city government is a negative factor. In Europe, on the other hand, the city is a far more positive factor in the life and thought of the people.

"The immediate bearing of this contrast on the question under consideration is that municipal ownership in the United States is regarded as a last resort. This of itself is an assurance that any experiments that may be made will be conservative. It is a grave mistake—especially on the part of the representative of

the public service corporations—to decry such experiments as socialistic and as foredoomed to failure.

"We must also bear in mind that in most of our large cities municipal ownership is practically impossible. It is possible that we shall find a way out of this difficulty through the Chicago plan of purchasing mortgage certificates, but it is evident that the sentiment of our American communities is still so strongly opposed to an increase in municipal indebtedness that even this plan is not likely to receive general acceptance."

President Bonaparte entered at some length into a discussion of the address of Prof. Rowe. He said that the fundamental laws of England favored the development of municipal ownership in England, while in the United States the laws in some States were opposed to the idea. There would have to be important changes in some of the constitutions of the States before the idea of municipal ownership could be tried on a large scale. He did not express an opinion for or against the plan, which is seemingly gaining in popularity in this country.

The League decided to make a thorough study of municipal ownership with a view to reaching some definite conclusion at a future convention as early as the wide range of investigation will permit.

Improving Electrical Situation in San Francisco.

By C. W. Whitney.

Electrical interests in San Francisco can hardly be said to be rapidly assuming their usual condition, but great progress, nevertheless, has been made toward supplying the public with telephone, telegraph, light, power and trolley service. On the evening of May 1 several residences throughout the Western Addition were lighted for the first time by electricity. Property owners are keeping the Department of Electricity extremely busy, inspecting wiring in residences and business places, and the San Francisco Gas & Electric Company announces that as fast as inspections are made and permits granted the company will turn on the current. Arc lighting has been resumed in the

FIG. 1.—CURIOUS EFFECT OF HEAT UPON RAILS.

Mission and Potrero districts and other limited sections in the southern part of the city.

Louis Glass, general manager of the Pacific States Telephone & Telegraph Company, states that his company now has 18,000 or 19,000 telephones throughout the burned district to which service can be restored as soon as relations can be established with the subscribers. Applications for the installation of telephones in new locations are receiving immediate attention, he says, and a new telephone directory is soon to be issued. It will prove valuable as a directory for the city as it now stands.

FIG. 2.—TROLLEY POLE BENT BY HEAT.

Enthusiasm over the utility of the automobile in San Francisco's days of dire need has caused many to overlook the invaluable service rendered by another modern invention, the telephone. It was the latter that scored the greater triumph, for in the face of obstacles that seemed insurmountable it brought

FIG. 3.—RUINS OF "ELECTRICAL ROW."

the various sources of organized effort into touch and hastened relief at a time when every second's delay meant the loss of life and property.

The company is now connecting up new and old subscribers at the rate of about 100 per day, and it is expected that 75 per cent of the volume of its exchange business will have been re-

turned in about nine months, with a very large increase in territorial development. The cities about the bay, Oakland, Berkeley, Alameda, Sansalito, San Rafael and San Jose, are housing many of those driven out of San Francisco and the applications for the best class of telephone service in those cities are quite up to the company's ability to install. It cost about $10,000 for the Pacific States Company to repair the damage done to its lines in Oakland as a result of the earthquake. Six hundred men were kept busy for three days making the necessary repairs. The business done by the corporation since the shake-up has amply repaid the company for its expense, however. As a result of the migration of people from San Francisco 1,000 new telephones have been installed, and of this number 600 are purely for commercial purposes. The company has increased its staff to 260 operators.

The Western Union Telegraph Company has installed a new and complete operating plant in a building located at Seventh and Pine Streets, West Oakland, near the water front. In a pavilion-like structure, 50 by 100 ft., which was constructed in four days, is housed an equipment even more up-to-date than that destroyed by the fire in San Francisco. The building is necessarily a rough affair of wood and corrugated iron, but it answer the present needs of the company admirably. While building an entirely new operating department the Western Union has also had to handle a business the volume of which has increased rather than diminished since the fire. To keep its force of 171 employes together the company has established a boarding-house near the new operating department, where the men

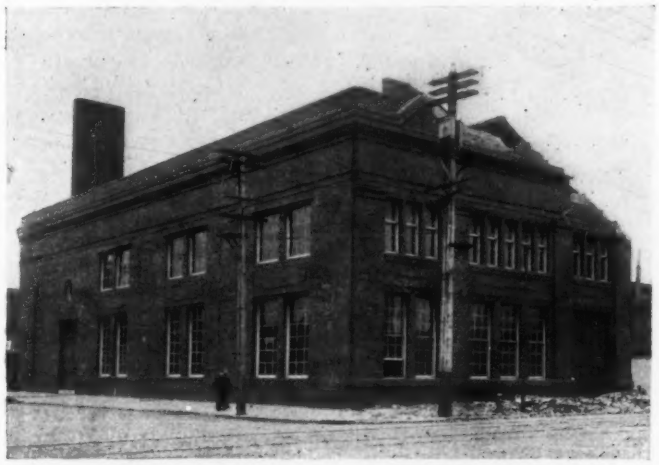


FIG. 4.—POWER HOUSE OF MUTUAL ELECTRIC LIGHT & POWER CO., DAMAGED BY EARTHQUAKE.

and women are served regularly with good substantial meals. Several tourist sleeping cars have been switched onto a side track and are used as sleeping quarters by many of the operators.

The cable steamer *Burnside,* which arrived from Seattle with a cargo of relief supplies, will repair the cables in the harbor before returning to Seattle.

Now that the great excitement is over, the meritorious deeds of many individuals and organizations are being recorded, but none are deserving of more praise and credit than the members of the United States Signal Corps, commanded by Captain L. D. Wildman. It was through their aid and perseverance that General Funston was able at all times to handle efficiently his 2,500 troops. General Greely, who is now in San Francisco, and who was once at the head of the Signal Corps, has spoken of their work in highly complimentary terms. Other officers active were Captains Black and Mitchell and Lieutenants Beacham, Grimm and Kumpe.

Against Municipal Lighting in Toledo.

A committee of the Toledo, Ohio, City Council has decided to strike out the three-year clause which was inserted in the new city lighting ordinance as a provision to enable the city to do its own lighting in case it desired to do so. The council committee does not think the city is ready for a municipal lighting plant, and will not favor it.

CURRENT NEWS AND NOTES.

THE CZAR AT THE TELEPHONE.—It is reported from Russia that the Czar is following closely by means of the telephone the proceedings of the Douma, the National Parliament. This sounds rather apochryphal, for it would be a very tedious job to sit out the proceedings of any parliament, even of the excited Russian national assembly at this thrilling juncture.

TELEPHONE AGENTS IN MEETING.—The annual meeting of the contract agents of the American Bell telephone system was held last week at Atlanta, to discuss methods of business getting, etc. The sessions were held with closed doors. The attendance was some sixty strong. Mr. E. J. Hall, vice-president of the American Telephone & Telegraph Company, was present and participated. Hospitalities were extended by the Southern Bell Company.

BRANCH INSTITUTE MEETING.—Thursday, May 10, the Pittsfield Branch of the American Institute of Electrical Engineers held its last regular meeting for the season. Mr. W. S. Barstow gave a most interesting and instructive talk on "Power Development in the Pacific Northwest," and the meeting was voted one of the most successful that has been held since the local branch was started. Mr. Barstow touched upon the Coeur d'Alene transmission at Spokane, the Snoqualmie plant, the Puyallup station, the Oregon Water Power & Railway Company's plant on the Clakamas River, and the old installation on the Willamette. The branch has held meetings every three weeks throughout the winter and has frequently had an outside speaker of standing in the profession to address it.

ZULUS AND SEARCHLIGHTS.—Advices from the colony of Natal, South Africa, state that in dealing with the natives now on the warpath, searchlights promise to prove as effective in subduing the sedition of the Zulus as British guns, judging from the display given this week by Native Commissioner Saunders before a huge gathering of Zulus at the N. Kandhala headquarters of the punitive force. The natives were awestruck, and regarded the searchlight as the eye of the Almighty. They said that God had turned it upon them in his anger. The flashing of the light on the surrounding hills, bringing in plain view the Kaffir trails as far as the horizon, powerfully impressed the Zulus, who, when the light was suddenly flashed in their faces, cowered and fell on the ground before what they termed the "latest witchcraft of the whites."

ALASKAN TELEGRAPHS.—It is stated from Washington that orders have been issued by Gen. Allen, the chief signal officer of the army, for the installation of the duplex system on the Alaskan cables. The commercial business of the cables has become so heavy that even by working night and day the operators are not able to handle all the dispatches. In April the receipts from the business of the Alaskan telegraph and cable lines was $18,500, and it is estimated that if the Government had paid for official cable dispatches, the income of the line would have averaged at least $1,000 a day. An appropriation is now pending in Congress for the construction of feeders to the main Alaskan cable, which will connect with Ketchikan, Wrangell, and Prince Edward's Island. As the country these branches would reach is rich in fisheries and the seat of many canneries, the War Department's view is that the business of the cables will be greatly increased. Many changes in the telegraph lines in Alaska are also in contemplation by the signal corps. The lines reaching north from Valdes to Eagle City, and extending to the western coast of Alaska, are very crooked, as the country is so rough that it was necessary to follow the streams with the telegraph system. Now, it is the purpose of the signal corps to straighten out these lines and shorten them wherever possible. In this manner it is believed the telegraph service will be improved, and the lines made capable of yielding greater income.

MR. MARCONI'S ILLNESS.—A great many friends of Mr. Marconi who have been expecting his arrival here for some months past will be glad to learn that at last his malarial fever shows signs of breaking. His temperature has been gradually falling, and it is expected he will now recuperate in health rapidly. It is believed that a trip to this country will be one of his first moves upon recovery.

NEW YORK ELECTRICAL SOCIETY.—The next meeting of the New York Electrical Society will be held at the Edison Auditorium, 44 West 27th Street, New York, Wednesday evening, May 23. Mr. F. B. Behr will deliver an address on "A Monorail Solution of the Rapid Transit Problem," and Mr. Max Schmidt will make some remarks on "The Moving Platform in City Transportation."

ELECTRICAL CONTRACTORS' CONVENTION.—The National Electrical Contractors' Association has carried out the arrangements for its sixth annual convention, at Cleveland, Ohio, on July 18, 19 and 20, and Mr. Alex. Henderson, master of transportation, has just issued notice as to fares and the reduction to be obtained by those securing convention certificates. The meeting promises to be large and well attended.

ATLANTIC WIRELESS.—Dr. Lee De Forest, on his return from the other side, asserts that actual transmission of signals with the system has occurred across the Atlantic. "My Irish experiments," he says, "were very satisfactory. They were conducted with the Bell kites and elevated conductors, and I am able to vouch absolutely for the truth of the story that messages were flashed across the ocean from Manhattan Beach to Bantry Bay, Ireland, where the receiving station was located. The distance over which the message traveled was a little more than 3,000 miles."

NATIONAL FIRE PROTECTION.—The tenth annual meeting of the National Fire Protection Association, will be held at the Auditorium Hotel, Chicago, May 22-24, when a number of important topics and reports will be considered. These include fire-proof construction, car houses, automatic sprinklers, theatre construction and equipment, lightning, signaling systems, etc. The new buildings of the Underwriters' Laboratories, under the direction of the National Board of Fire Underwriters, will be open for inspection, and on May 24 a series of tests will be conducted there. The membership of this body comprises insurance boards, associations and institutes.

SIGNAL CORPS WORK.—Reference has been made more than once to the work done by the U. S. Signal Corps in San Francisco. In a recent article on the subject, the *Chronicle* says: "When the work of the army in San Francisco in the days of the fire is told by those who know whereof they speak, there is one branch of the service which will receive praise that will be as unstinted as it is merited. Without the men of the Signal Corps, commanded by Captain L. D. Wildman, the 2,500 troops under General Funston would have worked like so many scattered individuals, without orders and without a head. 'I was once at the head of the Signal Corps,' said General Greely yesterday, 'and I feel a delicacy in speaking of their work here as I would like to do. But you may say from me that for three days the only electrical communication in the down-town section was over the wires that Captain Wildman's men strung over ruined walls through the heart of the burning district.' At 10 o'clock on Wednesday morning they had a wire from the Presidio to the edge of the burning district. Until 3 o'clock that afternoon, when the Postal Telegraph building went down, they kept one wire opened to Washington. General Funston, who was directing the troops from Market Street during those hours, was in communication with his base and with Washington all the time, when a newspaper man could not get a message out of the city for love or money, and the city telephone plant was down and out."

SWISS ALPINE TRACTION.—United States Consul Keene writes from Geneva that the Simplon tunnel is about to be opened to traffic, and the subject of the lines of access to the new international railroad is being constantly discussed in Switzerland. Besides the "Faucille" line through the Jura range, near Geneva, which has been talked about for years past, a new tunnel through the Bernese Alps between the Canton of Berne and the Canton of Valais, from which the Simplon line passes to Italy, is under active and practical consideration. The board of directors of the committee having that new enterprise in charge held a general meeting on March 5 and unanimously approved the project submitted by Chief Engineer M. Zollinger for a line to pierce the Bernese Alps under the Lotschberg. Electrical traction will be used, and the new tunnel will be 8⅗ miles long. The total cost is estimated at $16,984,000 at the outside. A Franco-Swiss syndicate of leading bankers and engineers, at the head of which is the firm J. L'Hoste & Co., of Paris, have pledged themselves to submit within two months from now their formal contract for executing the work. The electrical features of the Simplon tunnel installation have been described in these columns.

WORLD'S RUBBER PRODUCTION.—United States Consul Halstead, of Birmingham, quotes an estimate by two French experts, MM. Brenier and Claverie, that the total annual production of rubber throughout the world is 57,000 tons. Of this total 55 per cent comes from South America and Africa. The French possessions on the west coast of Africa produce 7,000 tons, and the French Congo 3,000 tons, while the output of the Belgian Congo does not exceed 6,000 tons. The consumption of rubber by the principal countries of the world in 1904 was as follows: The United States, 26,470 tons; Germany, 12,800 tons; Great Britain, 10,000 tons; France, 4,130 tons; Austria-Hungary, 1,320 tons; Holland, 1,218 tons; Belgium, 748 tons,and Italy, 588 tons. Consul-General Seeger writes from Rio de Janeiro that the rubber shipments from Brazil for the year 1905 were valued at $64,588,406, the average price per long ton being $2,044 for the 31,600 tons exported. The rubber exports and per ton value have both been steadily advancing since 1902, when they amounted to $34,186,564 and $1,241, respectively.

THE CURIES AND RADIUM.—The Council of the Faculty of Sciences has confirmed the initiative of the Minister of Public Instruction in appointing Mme. Curie to the chair of the University of Paris occupied by her late husband, with whom she was associated in the discovery of radium. An interesting letter from Paris to the New York *Evening Post* says, in regard to the late Prof. Curie: "Now that Pierre Curie has lost his life in a commonplace accident, the world begins wondering that it knew so little of him. He had the will not to be advertised, not to waste his time in talk and 'producing himself.' He lived in absolute retirement, answered questions and invitations as little as possible, certainly much less than is conventional. Face to face with him, you found a man very gentle, seemingly timid, and thawing at most into the simple, unceremonious talk of a student about subjects which preoccupied him, with extraordinary frankness, scrupulous to credit others with the discoveries they had made in his lines, and to refuse assent to hypotheses beyond what the facts warranted. He was intensely interested in the revolutionary physical theories which his discoveries started up, but he would always conclude, 'We have not yet all the facts; we must observe and experiment.' This singlemindedness was the most striking characteristic of one who will surely be more and more recognized as among the very greatest men of science of the generation now passing. All his mind was to learn and to help others to learn, without putting what he learned to personal profit, and without jealousy of that part of learning which he might rightly claim as his own. He accepted money prizes, high professorships with laboratories, because they helped him and others to learn by procuring the means of study. Decorations like the Legion of Honor, which would only accredit his person in that world which he avoided, he refused with simplicity and without noise."

WIRELESS CONFERENCE.—Secretary Metcalf, of the Department of Commerce and Labor, has designated John I. Waterbury, president of the Manhattan Trust Company, of New York, as the representative of that department at the International Wireless Telegraph Conference to be held in Berlin on June 28.

LONG-DISTANCE WORK.—Mr. A. C. Rice, consulting electrical engineer of Worcester, Mass., is at work on plans that are said to involve the delivery in that city of 50,000 horse-power from a point distant 250 miles from the city. No details of the enterprise have yet been made public, but the scheme is said to contemplate the distribution of an additional 65,000 hp along the line of route.

"THE EDISON WEEKLY" is the name of a new bulletin issued by the New York Edison Company. It is a "house organ" of a more intimate character than usual, being intended only for circulation among the staff and employes. "It purposes to foster a co-operative sentiment between the various departments with regard to business-getting and business-keeping. It aims to establish a belief in the minds of all that the company is interested in the efforts of each individual employe toward the furthering of the company's welfare. It intends to set forth impartially the result of satisfactory and effective work accomplished in any direction."

TROLLEYS IN SPAIN.—United States Consul R. M. Bartleman, of Seville, sends a report from the consular agency at Cadiz with reference to the electric street car line recently inaugurated in that Spanish city by the Campania Iberica de Electricidad Thomson-Houston, of Madrid. The electrical material came from the United States, the engines and boilers from Italy, and the 36 cars from Saragossa, Spain. The new line operates 12 miles of trackage, extending from Cadiz to San Fernando and Carraca, the Government arsenal. The site for an additional power house is being prepared with a view to ultimate extension of the line.

POCKET LAMPS AT THE OPERA.—Some enthusiastic Wagnerites have annoyed the orthodox Wagnerites at the Convent Garden Opera House, says a London dispatch, by using pocket electric lamps to enable them to see the printed score. During the Wagner performances the house is kept in darkness, in accordance with the system prevailing at Bayreuth, and the light from the little lamps suggested a swarm of fireflies. A protest was entered against the use of these devices and the management requested the enthusiasts to desist. It is stated that dealers in electric pocket lamps have done a brisk trade since the Wagner season began and prices for these lamps have soared.

NEW YORK TRAVEL.—The amount of passenger traffic in New York City under electrical conditions is something tremendous, and grows rapidly. The report issued by the State Railroad Commission gives the figures of the local passenger traffic for the three months ending March 31, 1906. Taking the city as a whole, there were 297,339,165 passengers carried, an increase of 37,061,250, or 14¼ per cent. In the entire city the number of surface transfers issued in the quarter was 68,212,755, an increase of 10,822,871, and the car mileage was 56,998,216, a gain of 6,522,434. The surface and elevated lines have fully recovered the patronage of which the opening of the Subway deprived them, but the Subway carried 41,000,000 in the quarter.

WIRELESS IN JAPAN.—It is semi-officially stated that the Japanese Government has adopted a wireless telegraph system, as the result of special investigation which has been in progress since 1900, which is unique and totally independent of other existing systems. A special dispatch from Tokio of May 12 says: "There is widespread indignation over the statement by the Berlin *Tageblatt* that Prof. Kimura, of the Imperial Navy, stole Reumer's wireless telephone method. The Admiralty officially denies the *Tageblatt's* allegation. It demonstrates that Kimura's system is radically different. Kimura ten years ago won distinction in pure mathematics at Yale. Later he developed the Japanese system of wireless telegraphy which contributed materially to Admiral Togo's victory over Rojestvensky's fleet."

CONDUITS FOR NASHVILLE, TENN.—The Western Union Telegraph Company has submitted plans to the Board of Public Works, of Nashville, Tenn., for underground conduits it proposes to construct for the reception of its wires in the city, according to the conduit ordinance. Plans have been submitted to the Board by the Cumberland Telephone & Telegraph Company, the Home Telegraph Company, Nashville Railway & Light Company and the Western Union Telegraph Company. By the ordinance the Board is required to act on the plans by July 1, 1906. Whether the Board is authorized to exercise discretionary powers in acting on the applications for permits to build underground conduits, or whether its powers in relation to these applications are purely administrative, is an important question. It is believed that the Home Telegraph Company will contend that the functions of the Board as far as the conduit ordinance is concerned is purely administrative, and that therefore it has no right to refuse to grant a permit to a company having an established telephone or telegraph system in the city, provided the company has complied with the provisions of the conduit ordinance. This is a general ordinance, and in it no person, firm or corporation, except the city and city officials, are specifically designated.

CENTRAL STATION ADVERTISING.—The plans of the National Electric Light Association for a general exhibit of central station advertising methods at the Atlantic City convention in June will result in a most interesting and useful display. Promises of contributions have been received from a number of companies including those in New York, Boston, Buffalo, Baltimore, Portland, Ore., Chicago, The Public Service Corporation of New Jersey, Brooklyn, etc. Mr. John Craig Hammond, who was formerly the advertising expert for Mr. H. L. Doherty at Denver, and did such good work there, has tendered his services for the exhibit to the chairman of the committee, Mr. T. C. Martin, and will take an active share in the work. Several of the companies are sending a large number of copies of their bulletins for distribution at the convention, and the Philadelphia Electric Company is preparing and will distribute a special Atlantic City edition of several thousand copies for the members, as well as for the general public. A large number of the companies are sending framed and unmounted original designs, plain and in color, used for the covers of the bulletins that are now such a feature of the campaign work in selling electricity, and these will be displayed on the walls, constituting a veritable art gallery.

OWNERSHIP INVESTIGATION.—A special cable dispatch to the New York *Tribune* from London, May 12, says: "The American experts of the National Civic Federation have been closely employed this week examining the plant and accounts of the South London tramways under the control of the County Council and the several private corporations, including the united tramways, the South & Metropolitan Gas and the Westminster, Metropolitan, City & London Electric Lighting Companies. The investigation of twelve municipal gas and electric tramway undertakings has been virtually finished, but the fourth private gas company remains to be selected, and the Dublin United and the Bristol tramways under private control have not yet been investigated, and another private street railway company is still unnamed. The preliminary survey will be closed by the end of the month and the results revised by the bulk of the commission from America. Messrs. Maltbie and Sullivan are not making premature disclosures. Probably gas will be found cheaper here than in America, whether supplied by municipal or private works, but of inferior quality. The electric plant, whether public or private, is not equal in efficiency to the American plant. The tramway circuits here are small in comparison with the American street railway systems, and passenger fares are not so low for long distances, although cheap for short distances."

RELIEF OF SAN FRANCISCO TELEGRAPHERS.—The New York Telegraphers' Aid Society last week forwarded $500 by telegraph for the relief of the members of the San Francisco Telegraphers' Aid Society.

WESTERN GAS ASSOCIATION.—The twenty-ninth annual meeting of the Western Gas Association will be held at the Hotel Hollenden, Cleveland, Ohio, on May 16, 17 and 18. Mr. Paul Doty, well known in the electric lighting field at St. Paul and elsewhere, is president.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION.—The fourteenth annual meeting of this society will be held at Ithaca, N. Y., June 29 to July 4,, in affiliation with Section D of the American Association for the Advancement of Science. The present membership of the society is 400.

RESTRICTING PLATINUM EXPORT.—It is stated that the Russian Minister of Trade and Industry proposes to summon a conference—of whom, the report is silent—to discuss the prohibition of exports of raw platinum, the imposition of a duty on platinum exports, and the establishment of government work for refining platinum.

MEETING OF RAILWAY TELEGRAPH SUPERINTENDENTS.—The twenty-fifth annual meeting of the Association of Railway Telegraph Superintendents will be held at the Adams Hotel, Denver, Col., June 21 and 22. Papers on various topics relating to the use of electricity in the operation of railroads will be read and discussed, and an interesting sight-seeing programme has been arranged for the entertainment of the delegates. Mr. P. W. Drew, Milwaukee, Wis., is secretary of the association.

HEIGHO!—We reprint the following latest anti-metric gem: "But let the gentlemen at Washington have a care. The American citizen is patient, but the proverb about the anger of a patient man should not be altogether forgotten. If this pernicious and meddlesome paternalism is not dropped, and if the disposition to enact some sort of compulsory metric legislation is not abandoned, there is but one thing to be expected. The engineers and manufacturers of the United States and of Great Britain are not to be trifled with. The campaign will be carried into the technical press, into committee, on the floors of both houses of legislation, and especially among the constituents of the men who are short-sighted enough to persist, and the question will not be settled until it is settled right."

INDIANAPOLIS TELEPHONE RATES.—Finding that it cannot give good service at the present rates, the Indianapolis Telephone Company, independent, has wisely but vainly been striving to get permission to make an increase. In a typical "town meeting," held in the City Hall on the night of the 4th inst., the patrons of the Indianapolis Telephone Company argued and declared emphatically and almost unanimously against the city making any changes in the company's franchise, permitting an increase in the rates now charged. The Commercial Club has likewise declared against any modification of the terms of the contract or increase in the rate. The Commercial Club resolved in favor of competitive telephone service, and expressed the belief that the company, with good management, could accomplish all needful improvements, give good service and make money at the present rates.

INCANDESCENT LAMP LEADING IN WIRES.—A patent has been granted to Herr Carl Schubel and assigned to the Watt Glow Lamp Company, of Vienna, describing a new method of leading in the wires of incandescent lamps. The specification states that the present method of using a short platinum wire entirely sealed in and soldered at either end to the leading-in wires is apt to produce fine cracks in the glass, allowing outer air to penetrate into the interior of the lamps. If, on the other hand, the soldering points are outside the seal, the leading-in wires are very apt to become bent. It is stated that according to the present invention this objection is entirely obviated. The method consists in the use of a glass bridge soldered to the bottom of the lamp with a free space between the ends of the bridge and the lamp bottom. The leading-in wire is sealed in this bridge and the soldered joint is in the free space between the bridge and the bottom of the lamp.

ENGINEERING LECTURES AT UNIVERSITY OF MINNESOTA.—The programme of lectures delivered before the students of the electrical engineering department of the University of Minnesota, by practicing engineers, included fourteen topics for the current scholastic year. Ten of the lecturers have already been delivered, and the following will be presented before the end of the year: "The Design and Construction of a Steam and Hydro-Electric Power Plant," by Mr. Geo. A. Damon; "Underground Conduit and Cable Systems," by Mr. S. G. McMeen; "The Design of the Engineering Features of a Large Modern Office Building," by Mr. Chas. L. Pillsbury; "The Cost Estimation and Installation of the Engineering Features of a Large Modern Office Building," by Mr. A. L. Abbott. Those who previously delivered lectures are Messrs. E. P. Burch, J. M. S. Waring, Lee H. Parker, A. G. Wessling, E. B. Craft, J. A. Stewart, Chas. E. Downton, Truman Hibbard, J. R. Cravath and Prof. C. F. Burgess.

ELECTRICAL STUDY IN BELGIUM.—United States Consul-General Roosevelt states that in October, 1906, there will be placed at the disposition of Belgians the Laboratory-Museum of Electricity of Brussels, built, equipped, and will be offered to the public by Robert Goldschmidt, of Brussels. The object of this work is the development and extension of the use and application of electricity in Belgium by practical experimental instruction. The institution will contain all kinds of electrical models and appliances, which may be freely handled for study and experiment. Models and apparatus will be conveniently placed at the disposition of the public upon separate tables, and may be connected with the electric current at will. For example, a person desiring to familiarize himself with running an electric tramway, will find a complete model, about ten inches long, of an electric car, which he may freely handle for examination, and operate upon the diminutive rails. Reduced models of every part of an electric tramway system, various dynamos, etc., are to be found in the museum. Mr. Goldschmidt hopes to extend the knowledge of the great possibilities of electricity through these practical methods.

EXHIBITORS AT ATLANTIC CITY.—The following exhibitors have already secured space on Young's Pier at Atlantic City for the coming convention of the National Electric Light Association: Illuminating Engineering Publishing Company, American Electric Heater Company, Atlantic City Company, American Vibrator Company, Sangamo Electric Company, American Instrument Company, American Circular Loom Company, Curtis Advertising Company, Electric Storage Battery Company, H. W. Johns-Manville Company, General Storage Battery Company, Stanley-G. I. Electric Manufacturing Company, Simplex Electric Heating Company, Electrical World, Dearborn Drug & Chemical Works, Addressograph Company, Allis-Chalmers Company, *The Electrical Review,* The Phelps Company, *The Central Station,* Southern Exchange Company, Standard Vitrified Conduit Company, Automatic Refrigerating Company, Wagner Electric Manufacturing Company, Beck Flaming Lamp Company, Standard Paint Company, Metropolitan Engineering Company, Westinghouse Publishing Department, Federal Electric Company, A. F. Moore, Mayer & Englund Co. (Electric Service Supply Company), General Electric Company, Excello Arc Lamp Company, Oneida Community, Fort Wayne Electric Manufacturing Company, John L. Gleason, The Philadelphia Electrical & Manufacturing Company, Niagara Tachometer & Instrument Company. This represents a total of 6,840 sq. ft. As a matter of fact, this is almost all the available space, and some eight concerns are now negotiating for the two small booths left. It is thus evident that the exhibit will be unusually large and interesting.

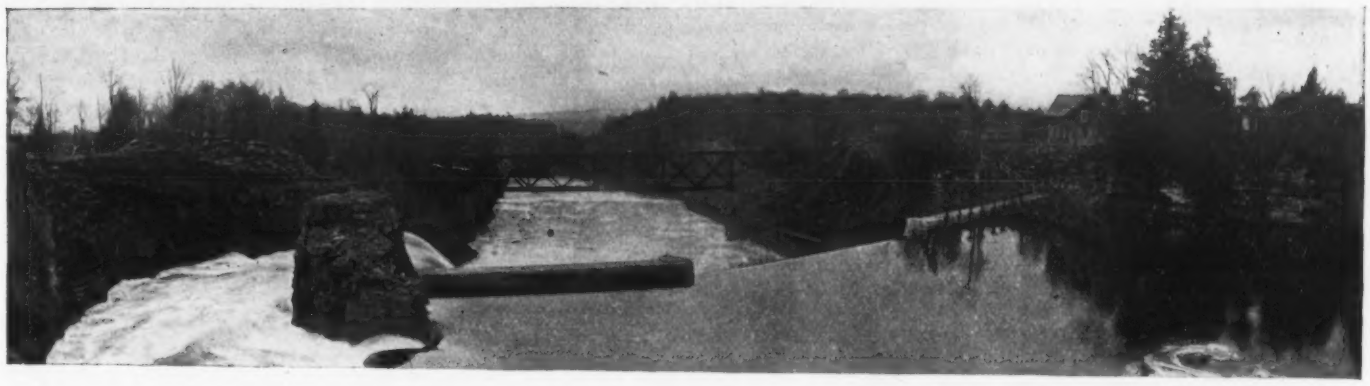
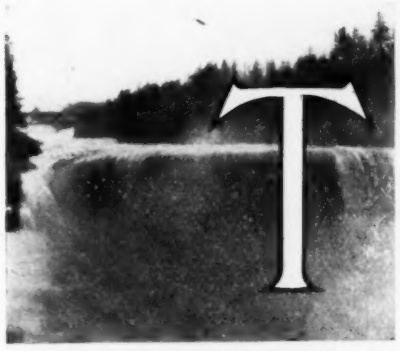


FIG. 1.—LOOKING DOWN FROM CLIFF ABOVE DAM AT TRENTON FALLS.

The Hydro-Electric Developments at Trenton Falls, N. Y.



THE waters of the Canada lakes in the Adirondacks of New York State find their way to the Mohawk River through two streams known as the East and West Canada Creeks. The former empties into the Mohawk at East Creek and the latter at Herkimer. The West Canada Creek is the larger, and near the village of Trenton Falls it has a descent of nearly 300 ft. in less than a mile. It is at this place that the 8,000-hp hydro-electric station of the Utica Gas & Electric Company is located.

THE DAM.

The dam, which is shown in Figs. 2 and 3, is a concrete structure of the gravity type, 300 ft. long and 60 ft. high, built across the Creek on the arc of a circle having a radius of 800 ft., at a point about three-quarters of a mile distant from the power house.

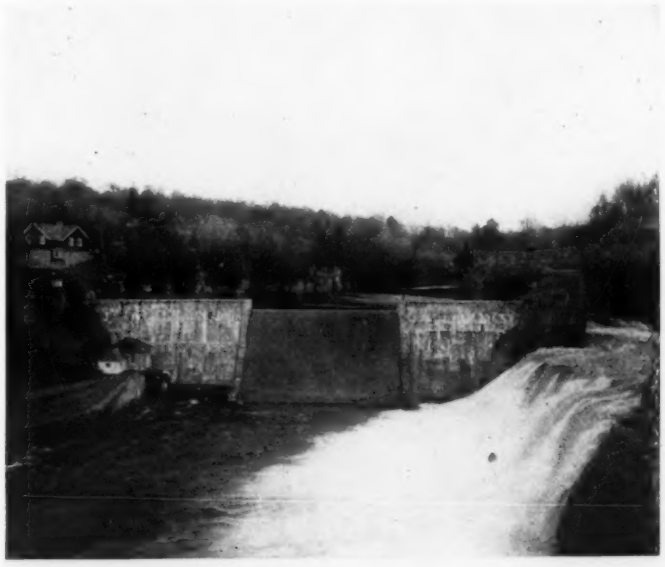


FIG. 2.—VIEW OF DAM FROM RAILWAY BRIDGE.

Eight 60-in. cast-iron pipes are built into the dam near the bottom, two of which supply the pipe line feeding the turbines now installed, two for the supply of a second pipe line when the power house is extended, and four to assist the waste weirs in carrying off the excess water in times of extreme floods. All of the 60-in. pipes are equipped with cast iron sluice-gates having bronze guides and are operated from the top of the dam.

The flood water weirs above-mentioned are two in number, one being built at right angles to the dam and close by it on a rock shelf on the east bank of the stream, the other forming a part of the dam proper. The first weir or spillway mentioned is 160 ft. long, the crest being 9 ft. lower than the top of the coping on the dam. The second weir is 100 ft. long and its crest is two feet higher than the crest of the former.

By this construction, the waste of flood-water in the reservoir will flow over the spillway first mentioned through a rock cut around the dam to the Creek below until the water flowing over it is two feet in depth, when the spillway on the dam will come into action and both weirs will then carry the waste water. The first weir mentioned can be provided with flash boards, so that the level of the water in the reservoir can be raised two feet during the dry season.

Both the dam and the weir on the dam are capped with heavy stone coping securely held by dowel-pins, while substantial stone

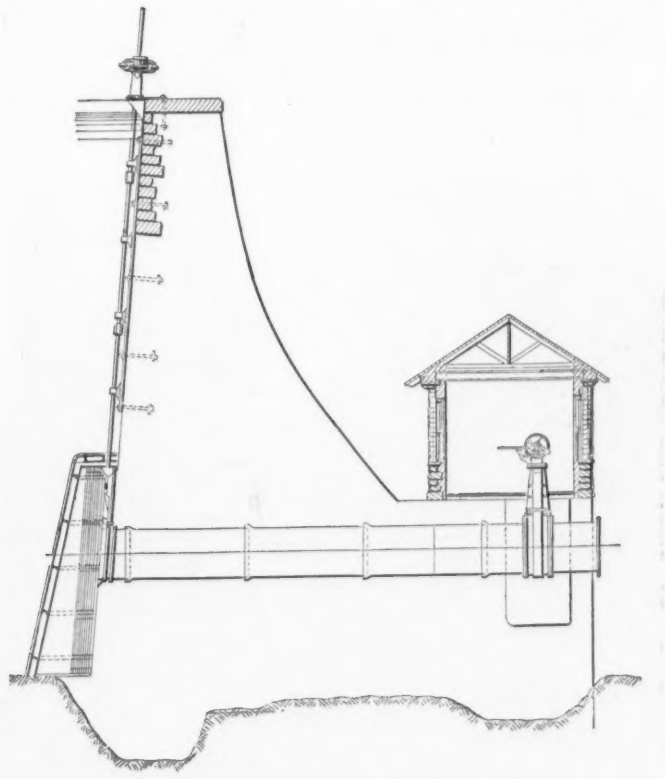


FIG. 3.—CROSS-SECTION OF CONCRETE DAM.

wing walls are constructed on the downstream face of the dam to confine the flood water within the limits of the spillway and thereby protect the face of the dam from injury due to debris, etc., in time of floods.

THE PIPE LINE.

The conduit which conveys the water from the reservoir to the turbines in the power house is 84 in. in diameter and about 3,700 ft. long. It is connected to the two westerly 60-in. pipes

in the dam by means of a 60 by 60 by 84-in. cast-iron Y piece and two 60-in. gate valves enclosed in a gate house, the latter being used to control the flow of water in the pipe line.

The long pipe is composed of wooden stave and steel plate pipe, the major portion of its length being constructed of Texas pine staves securely held in position by round iron bands, and joined to the steel pipe 2,900 ft. from the dam (see Figs. 4 and 5).

Twenty wooden staves, each 2⅜ in. thick, sawed on radial lines, are used in forming the circumference of the 84-in. diameter circle, the lumber being the best of its respective kind that could be obtained.

The steel pipe, which is about 800 ft. long, is built up of plate varying from ⅜ in. to ⅝ in. in thickness, and thoroughly coated inside and out at the mill with hot asphalt pitch. All connections of plate are made with lapped joints, the circumferential seams being single riveted, while the longitudinal seams are double-riveted (Fig. 6). All pipe constructed of ⅜-in. material is stiffened by means of angle irons.

The wooden stave pipe is built on a light descending grade, and it winds in and out along the west bank of the Creek throughout its entire length. After its junction with the steel pipe, the grade becomes much greater and the pipe continues in a straight line for several hundred feet to a standpipe 84 in. in diameter and about 200 ft. in height, which is built into the supply conduit to relieve any pressure in the line caused by extreme load conditions. This standpipe, which is covered with shingled casing having a well-shaped cupola at the top, is 20 ft. higher than the dam.

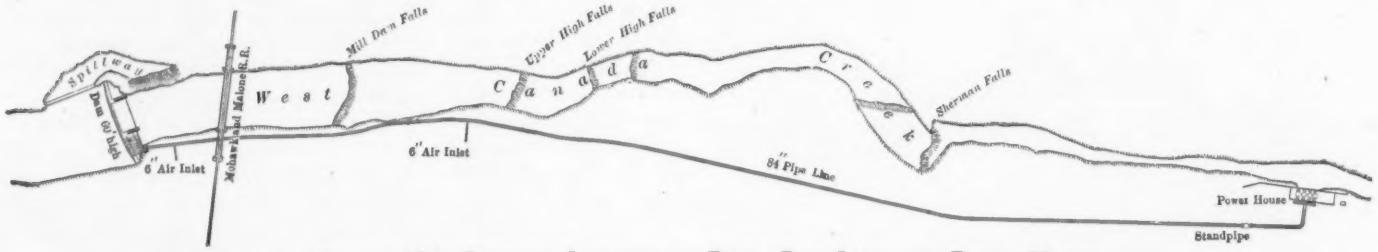


Fig. 4.—Map Showing Location of Dam, Pipe Line and Power House.

Just after passing the standpipe, the penstock descends along the cliff at a sharp angle to a reservoir near the power house, 125 ft. below the top of the bank. The reservoir is anchored on concrete foundations just outside the west wall of the power house. It is provided with four 84-in. outlets, each of which delivers water to a turbine wheel under a head of 266 ft. The flow of water to each turbine is controlled by a 48-in. gate valve, the arrangement being such that any or all valves can be operated simultaneously by hand, or by power furnished by a Pelton water wheel.

The penstocks to the turbines, the pipe line and receiver are all equipped with valves to assist in relieving any excess pressure which might come on them, and the main pipe line is provided with a number of air inlet pipes to allow for the escape or intake of air when the line is being filled or emptied.

Hydraulic and Electrical Machinery.

The turbine units are six in number, four driving the large generators and two furnishing power to the exciter dynamos, as shown in Fig. 7. The former units are of a Fourneyron or out-flow type, the water from the wheel runners discharging into a draft tube. They have vertical shafts (Fig. 8), Porter-Allen hydraulically-operated governors, and are direct connected to the generators. They have a rated capacity of 2,000 hp at full gate opening when working under 264-ft. head.

The exciter turbines, which are of the Girard type, develop 100 hp at full gate opening when operating under the above-mentioned head. They also have vertical shafts, direct-connected to the dynamos, the speed regulation being under hand control. The supply pipes of each exciter turbine, which are twelve inches in diameter, are attached to the penstock of the units nearest them, the flow of water being controlled by a gate valve operated by hand power only.

The main generators are alternators of the internal revolving-field type, producing three-phase current at 2,300 volts, and 60 cycles when the field is rotating at 360 revolutions per minute. The exciter dynamos are 125-volt machines and revolve normally at 750 revolutions per minute.

The switch-board (Fig. 10) is of the usual type, having a marble panel for each of the large units and one panel for the two exciter units. It also contains separate high and low-tension

FIG. 5.—WOODEN-STAVE PIPE UNDER CONSTRUCTION.

FIG. 6.—SEVEN-FOOT STEEL PIPE.

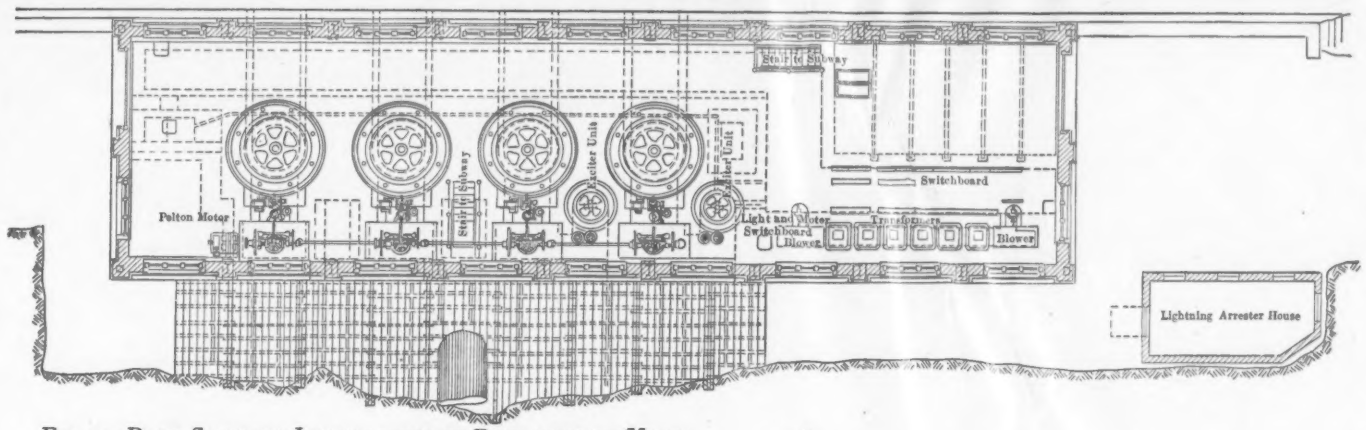


FIG. 7.—PLAN SHOWING INSTALLATION OF FOUR 2,000-HP UNITS.

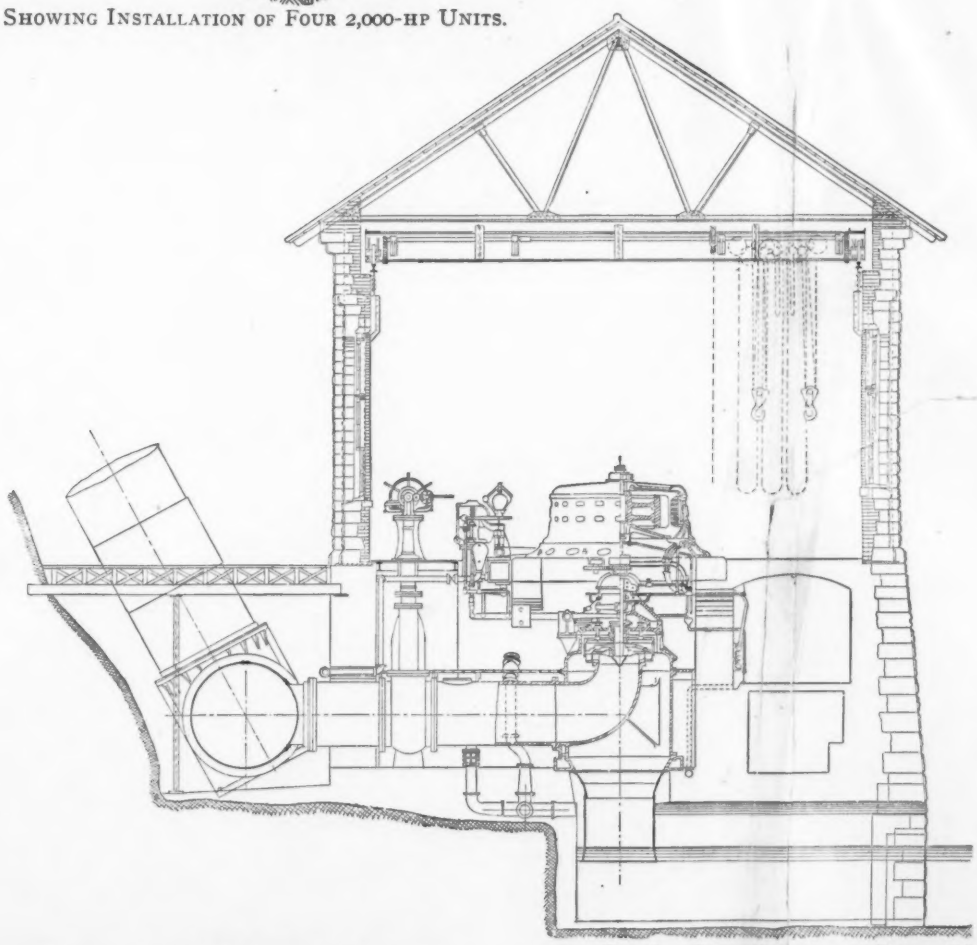


FIG. 8.—CROSS-SECTION OF POWER HOUSE.

FIG. 9.—POWER HOUSE AND LIGHTNING ARRESTER HOUSE.

FIG. 10.—SWITCHBOARD IN POWER HOUSE.

feeder panels. The potential of the current leaving the low-tension feeder panel is stepped up to 23,000 volts by air-cooled transformers, from which the current passes to the high-tension feeder panel out of the building through the lightning arresters located in a separate building (Fig. 9) near the power house,

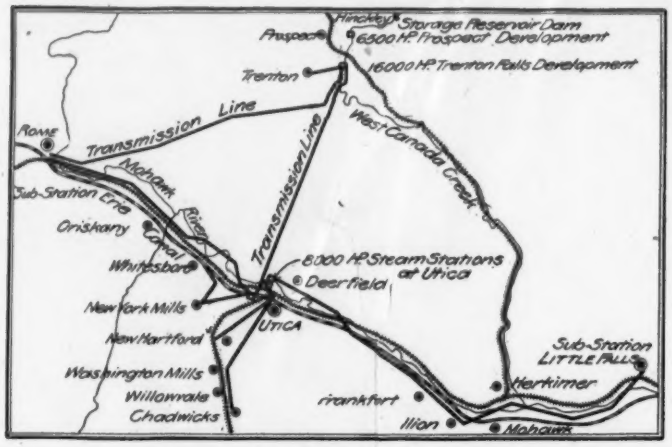


FIG. 11.—MAP OF TRANSMISSION LINES.

and finally along the transmission line to the sub-station in Utica, 12 miles away.

THE POWER HOUSE.

The power house, which is situated in a rocky gorge slightly more than 100 ft. in width and varying from 125 to 150 ft. in depth, is a well appointed building in all respects. It is 32 ft. wide and 128 ft. long inside, and around the skeleton steel frame-work are built walls of Governeur marble, while the interior is trimmed with white and brown enamel brick to the window sills and above this point with cream pressed brick to the roof. It is furnished with a 10-ton traveling crane for convenience in handling any part of the hydraulic or electrical machinery. A view of the interior of the power house is shown in Fig. 12. The turbines are all below the granolithic floor, in separate wheel pits.

One important feature of the plant is there is no trouble from anchor ice, due to two precautions which were taken when the dam was built. First, the pipe line enters the dam 40 ft. below the surface of the water, and anchor ice does not sink to the level of the pipes. Second, the crest of the spillway which carries surplus water around the ends of the dam is 2 ft. lower than the spillway on the dam, and a strong current is thus established which carries the anchor ice around the end of the dam, and far away from the pipe line intake, which is on the opposite side of the stream.

At Utica there are two modern direct-connected steam stations, with a total capacity of 8,000 hp, which can be started at once in case of interruption of the transmission lines from Trenton Falls. The last steam unit, which was installed last fall, is a 3,000-hp steam turbine and Bullock generator of same capacity, furnished by the Allis-Chalmers Company.

EXTENSIONS.

The company proposes at once to add 8,000 hp to its Trenton Falls station, bringing its capacity up to 16,000 hp, and also develop its water power at Prospect, about one mile above Trenton Falls dam. At Prospect a plant having a capacity of 6,500 hp will be built, and at Enos on the Black River, nine miles from Prospect, the company will build a station having a capacity of 3,000 hp; thus the company will possess a grand total of 25,500 hp in hydro-electric generators.

TERRITORY SERVED BY THE COMPANY.

The territory served by the company lies mainly in the Mohawk Valley in Oneida and Herkimer Counties, and includes the cities of Utica and Rome and the villages of Trenton, Oriskany, Whitesboro, Yorkville, New York Mills, New Hartford, Washington Mills, Willowvale, Chadwicks and Deerfield, in Oneida County,

FIG. 12.—VIEW OF INTERIOR OF POWER HOUSE.

and the villages of Frankfort, Ilion, Mohawk, Herkimer and the city of Little Falls, in Herkimer County.

The entire development was designed by Mr. W. A. Brackenridge, consulting engineer, Niagara Falls, N. Y., and the work carried out under his direction. The general contractors for the work were the Utica Gas & Electric Co., for the power house and transmission line; the Warren-Burnham Company, Utica, for the dam and power house foundations; the T. A. Gillespie Company, of New York and Pittsburg, for the 84-in. pipe line; the I. P. Morris Company, Philadelphia, for the hydraulic machinery, and the General Electric Company, Schenectady, for the generators and switchboard.

Electrical and Mechanical Equipment of the New Engineers' Club Building, New York.

THE new club house now being built in West Fortieth Street, New York City, and which is to be the home of the Engineers' Club of that city, will be provided with an electrical and mechanical installation well in keeping with the commodious and luxurious accommodations which the architect's designs will provide for the members. It embodies, moreover, a number of ideas which have not been tried to any considerable extent in buildings of a similar character, but which it was concluded would produce good results in this case.

As will be seen from Fig. 1, the architectural features of the club building provide a simple but dignified ornate exterior, and the interior will be equalled by but few buildings of a similar character in this country. The location on the south side of Fortieth Street gives a northward outlook upon Bryant Park and affords an advantageous view of the magnificent New York Public Library.

The first floor of the building will include the vestibule, reception rooms, administration office, coat room, grand stairway, foyer and main hall, in which latter will be three electric elevators and at the extreme rear of this floor will be the main café and grill room. On the second story the large clubroom will be in the front of the building and the library will be in the rear. On the third floor there will be the billiard room in front and the remaining space will be given up for the committee rooms and card rooms. The next six stories will be devoted to bedrooms and immediately above the bedroom floors will be the breakfast room, serving room and two private dining rooms with a large reception room adjoining.

The banquet room will take up practically the entire eleventh story, and the twelfth story will be entirely given over to the service work. On this latter floor will be the cooking range, plate warmer, dish washer, steam tables, etc., all of which require service from heating, ventilating or power systems throughout the building.

The front portion of the roof will be devoted to a roof garden and at the rear will be the laundry and a room in which will be located some of the machinery used in connection with the ventilating system.

In the basement will be the general toilet, barber shop, steward's office, storerooms, etc. In the sub-basement the machinery for the operation of the lighting, heating and refrigerating plant and elevator equipments, and also a portion of the ventilating machinery will be installed.

There will be two water-tube boilers set in battery, each having approximately 200 hp capacity. These will be located in the rear end of the sub-basement. A coal storage room adjoining the boiler room has been provided and, in addition, an even larger room in the front of the building for the storage of coal in quantity.

The boilers are connected by a steel plate flue and breechings with the steel smokestack, which passes up the rear of the building. The smoke connections will be provided with a hand damper at each up-take from the boilers. In addition, there will also be a balanced swinging damper in the main connection. This will be operated by shafting controlled by a Locke automatic damper regulator. Each boiler will be equipped with an injector for feeding.

The power and exhaust piping will be briefly as follows: Branch connections will extend from the steam drums of each boiler to a main high-pressure line, and from the latter there will run a main line to the engine room connecting with the high-pressure distributing header for the engines. There are separate high-pressure branch connections going to each engine, with long sweep bends instead of fittings.

A branch main will be run from the high-pressure line near the boilers and will connect with all the steam pumps, the moistening apparatus, the kitchen and laundry service, the hot-water tanks, refrigerating apparatus, heating apparatus, air compressors, sewage ejectors, vacuum system exhauster, reducing valves, etc. All individual power branches are run from the top of the main.

The low-pressure steam and return piping of the heating system has been so designed as to give the proper circulation of steam under a one-pound pressure at the reducing valve. The steam lines for supplying the tempering coils of the ventilating apparatus will be carried individually from the boiler room and will be under separate control.

There will be three electrical generating sets in all, as shown in the sub-basement plan (Fig. 2). Each of the engines will be protected by a Cochrane vertical type steam separator in the branch pipe, and the drip connection from these generating sets will be through automatic discharge traps to the high-pressure receiver of the muffler tank. The high-pressure steam distributing header will be 18 in. internal diameter and its drip outlets at the bottom will discharge into the receiver of the muffler tank in the same manner as those from the engine.

The heating and ventilating apparatus and the kitchen apparatus, moistening apparatus, etc., will be protected by pressure reducing valves. A back pressure valve will be installed on the main exhaust pipe. The heating apparatus will have a 10-in.

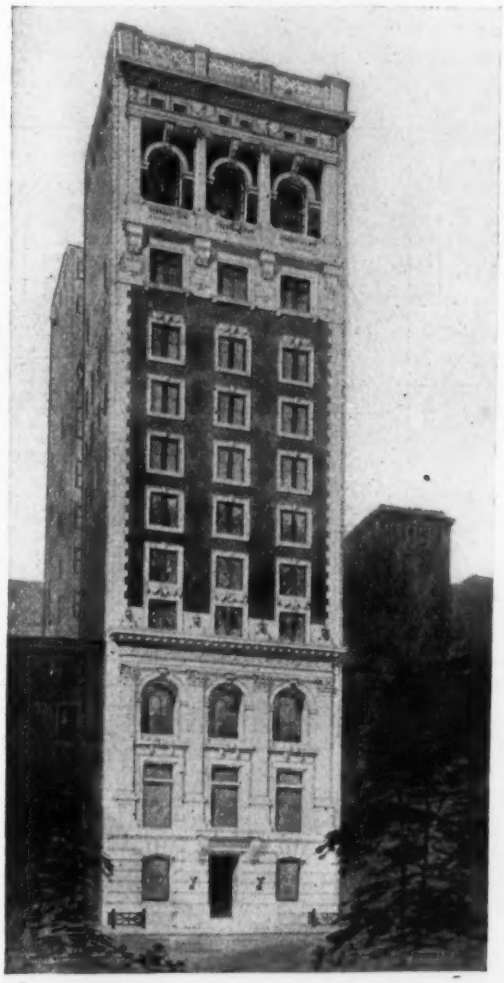


FIG. 1.—BUILDING OF THE ENGINEERS' CLUB OF NEW YORK CITY.

exhaust connection and will be protected by a grease extractor and provided with a valve.

All of the rooms in the building will be warmed by direct radiation, the heating system being designed to provide a temperature throughout of 70° F. in zero weather with a steam pressure not exceeding 5 lb. in the heating main. There will be about 228 radiators and heating coils aggregating 9,600 sq. ft. of heating surface in all. The system selected for this building is so arranged that either live steam at reduced pressure or exhaust steam, or a combination of both may be supplied to all radiators as well as the tempering coils, hot water tanks, etc.

The ventilating system will supply fresh air throughout the building in general, and in all the important rooms direct, the

system being that of forced air propelled by centrifugal fans passing over tempering coils. As already mentioned, vitiated air will be removed by centrifugal exhaust fans.

In order to simplify the equipments and to reduce the size of the air ducts otherwise required, the building as a whole has been treated as though it consisted of two separate structures the "upper" and the "lower," and the ventilation of each part has been taken up as a separate problem. An independent equipment of blower and exhaust fans will be installed in the sub-basement for the lower half, and a similar equipment in the machinery room on the roof will serve for the upper half of the building.

The fan supplying air for the lower stories will be located in the sub-basement and will have a blast wheel of 6 ft. diameter and 3 ft. 6 in. wide. The exhaust fan for the lower stories will be of the same dimensions as the blower fan. The upper stories will be provided for in a similar manner with a blower fan and an exhaust fan located in the machinery room on the roof. The dimension of the blast wheel of these fans, however, will be 5 ft. 8 in. diameter, and 3 ft. wide.

To insure positive and independent ventilation for certain rooms, there will be installed in the sub-basement a blast wheel exhaust fan 4 ft 6 in. in diameter, for removing the air from the engine room, sub-basement and certain toilets on the various floors. In the machinery room on the roof there will also be an exhaust fan of 4 ft. diameter for the removal of the air from the kitchen, kitchen service rooms and the toilets on the upper floors. Each one of the blower and exhaust fans will be driven by a motor on an extension sub-base, and connected directly by a flexible coupling with the shaft of the fan. Both the motors and the fans will be provided with ring oil bearings.

In all there will be 1,075 sq. ft. of heating surface in the tempering coils for the blower fan in the sub-basement and 762 sq. ft. in the coils of the roof blower fan. In each case the fresh air will, after leaving the coils, pass through a filter before being supplied to the interior of the building. A thermometer will be placed in each fresh air chamber and in each main tempering air duct. Also one wet and dry hydrometer will be placed in each main fresh air duct.

In such a club building no small amount of attention must be given to the question of refrigeration and proper storage of supplies, and as in a hotel, adequate facilities for carrying on this end of the business must be provided. For this installation the Carbondale Machine Company is furnishing an absorption exhaust steam refrigerating machinery capable of cooling 1,168 cu. ft. of refrigerator box space to an average temperature of 38° F., when using exhaust steam not over 1 to 3 lb. pressure, and with not over 12 gal. of water per minute at 70° F., or correspondingly less water at a cooler temperature in winter weather. This machine will be capable of cooling 20 gal. of brine from 10° to 0° F. per minute. It will be provided with the usual condenser and brine cooler and absorber, also an ammonia direct-acting pump of 10-in. stroke and 2½-in. diameter cylinder, and a duplex circulating brine pump. A brine tank will have a storage capacity of 2,000 gal.

The engineer's designs and specifications for the power plant called for three steam engines of suitable design for direct connection to engine type generators. Through the generosity of the Allis-Chalmers Company and the General Electric Company all three of the generating sets will be furnished the club without charge.

In this connection it should be stated that the generosity of manufacturers was not confined to engine and dynamo builders alone, but extended also to the manufacturers of the boilers, elevators and other items of equipment for this building, the boilers being given outright by the Babcock & Wilcox Company and the elevators furnished at cost by the Otis Company.

The working steam pressure at which the boilers will be operated was changed to 125 lb. to accommodate the turbine set to be referred to later.

The two 50-kw units will be given the club by the Allis-Chalmers Company and will each consist of a Corliss type simple horizontal engine direct-connected to a Bullock type generator. The speed at which they will run is 125 r.p.m. These units will be identical except that one will be right-hand and the other left-hand.

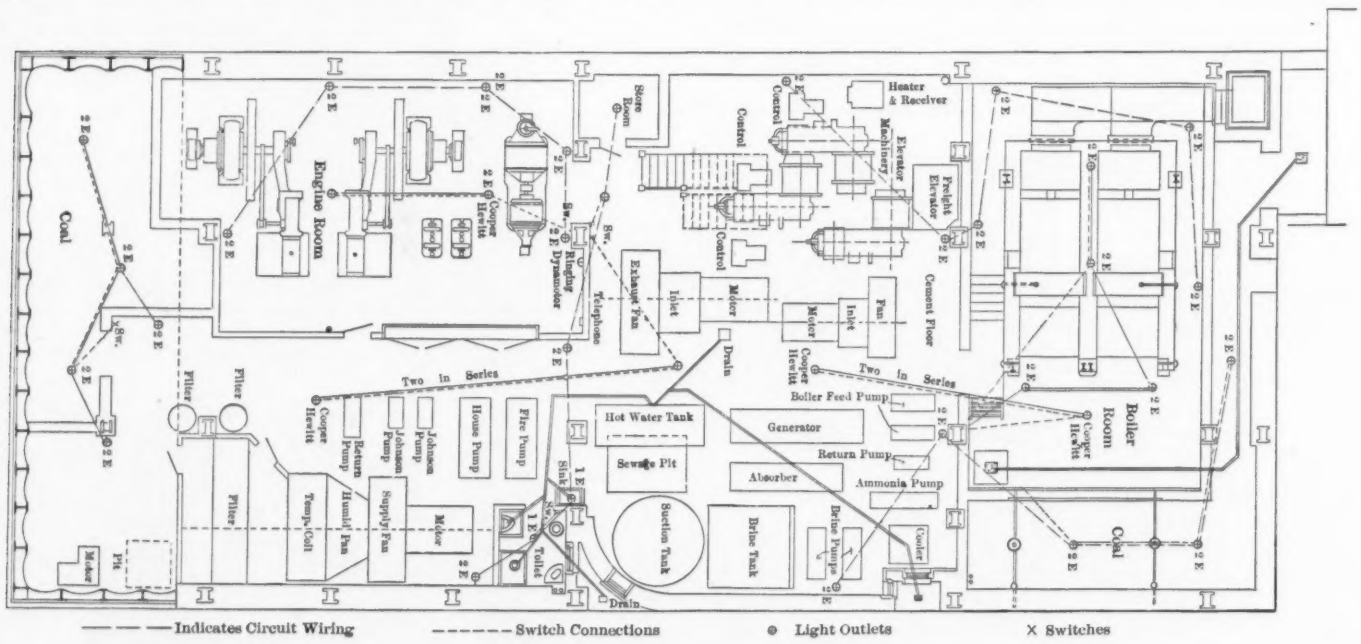


Fig. 2.—Arrangement of the Equipment in the Sub-Basement of the Engineers' Club Building.

The 75-kw unit will be donated by the General Electric Company, and will consist of a Curtis steam turbine designed to operate non-condensing, and to run at a speed of 2,400 r.p.m. The generator will be directly connected to the extension of the shaft of the turbine, the complete unit being assembled on one cast-iron base and set horizontally.

All three of the generators will be compound-wound for 245 volts at full load current, and they will furnish current to a mixed motor and lighting load throughout the building. Two rotary balancing sets each consisting of two compound-wound, 120-volt, direct-current generators, mounted upon a common base and direct-coupled, will be installed in the engine room. Each of the machines in these two sets will have a full load current-carrying capacity of 40 amp.

These balancing sets will be used to furnish current to the neutral of the three-wire lighting system. The balanced portion of the current will be taken care of by the main generators directly, and one or both of the balancers will furnish any excess

of current which may be required by either side of the system, and thus maintain the neutral wire at a potential midway between the outside wires. Each balancer set will be provided with a back-connected rheostat which will be mounted on the switchboard and the starter for each set will be mounted on a small independent panel placed near the balancer.

The main switchboard will be set in an opening in the engine room wall, thus saving considerable valuable space in this room. The front will face the engines and the rear, which will be protected by fire-proof doors, will be accessible from the sub-basement passage, as shown on the plan herewith. This switchboard will consist of seven white marble ¼-in. bevel sided panels, each 72 in. high and 1½ in. thick. The panels will be as follows: three generator, one total output, one equalizer, one lighting feeder and one power feeder panel. A substantial angle iron frame will support these seven panels and the front of the board will be finished at the top and bottom with a white marble molding 4 in. deep. At the bottom under the molding will be a sub-base of marble slabs eight inches in width, finished to match the board.

The equalizer panel will be equipped with two overload alarms, one being for each balancer. These alarms will consist of a single-pole circuit-breaker of the overload type with the current opening switch omitted. The spring plunger, which ordinarily serves to open the breaker when the latch is liberated by the action of the plunger in the solenoid, is to be extended back through the end of the spring chamber, and will be equipped with an insulated metal ring. Two spring clips with binding posts for bell wire will be secured in such a manner that when the arm of the overload alarm is liberated by an overload the spring plunger will fly out and the metal ring will make contact with each side of the clips and thus instead of cutting the balancer out of circuit an alarm will be given and the attendant will then adjust the load properly, the balancer being designed to carry such overload as it might be subjected to for the period required for rectifying the excessive unbalance.

The power panel will have nine two-pole feeder switches and also three 200-amp., single-pole, double-throw switches. The function of these latter switches is to connect the three banks of feeder switches immediately below each to either the power or the lighting bus-bars at will. This is accomplished by having one side of all the power feeder switches connected with the common negative bus-bar and the other side with the middle point or hinge of the respective double-pole switches. The outer clips of these switches are connected to the power and light positive bus-bars, respectively. The construction of these double-throw switches is such that the circuit is not opened in throwing from one set of bus-bars to the other. Thus the three banks of power feeder switches may be fed from the independent power buses when two or more generators are running, or from the lighting buses during the hours of the day when it would not pay to run more than one machine.

The conduit system for the conveyance of the feeders and circuits to their respective outlets have been most carefully planned with a view to simplicity and convenience, due care being taken to avoid as far as possible the crossing of pipes or ducts. All conduit will be concealed in the walls, floors or ceilings. A panel box will be installed on each floor from which the conduits for the branch lighting circuits will be run to the various outlets.

The power feeders have been treated as an independent system from those for the lighting service. Conduit for these feeders will be run direct to the various outlets to be provided near the respective motors which will transmit the power to the elevator machines, sidewalk hoist, freight elevator, blower and exhaust fans, the dish-washing machine, silver buffing lathe, etc.

Current for the various motors throughout the building will be distributed at 240 volts by means of two wire feeders run directly from the various feeder switches on the power feeder panel. Seven of these feeders will be run, one each to the sidewalk hoist, and the three elevator motors, one to the fan motors located in the sub-basement, one to the fan motors located on the roof and one to the motors driving the dumbwaiter, buffing lathe, dish-washer and several machines in use in the laundry.

Separate lighting feeders will be run from the feeder switches on the lighting feeder panel to each floor of the building and to the roof and connected to distribution panelboards. These feeders will each consist of three wires and the current will be fed on the 120-240-volt, three-wire system.

The panelboards will each be of marbelized slate having three polished copper bus-bars running vertically up the center of the panel and two-pole branch circuit switches arranged symmetrically on each side. The feed connection will be made solid without switch or fuses. From the panelboards two-wire branch circuits will run to the various lighting fixtures throughout the building.

The lighting of the sub-basement will be accomplished by a combination of incandescent lamps with Cooper Hewitt mercury vapor lamps, each of the latter giving 300 cp when two are connected in series across a potential of 120 volts.

The call bell system throughout the building will be supplied with current by a motor-generator capable of supplying 7½ amp. at 8 volts, and by an auxiliary primary battery to be used when it becomes desirable to shut down the motor-generator for any reason.

The system will consist of seven distinct divisions or subsystems, namely, three annunciator call systems with annunciators in the office, bar and kitchen, respectively; an elevator call system; a door bell system, a fire alarm system and an overload alarm system for the rotary balancers in the engine room. These will all be supplied from a panelboard in the engine room by means of separate feed wires. All wires used in connection with the bell systems will be rubber-covered and will be run in metal conduit. Branch circuit boards will be installed on a number of the floors in cabinets from which the wires will run to the individual push buttons placed at convenient locations throughout the building.

A complete conduit system for the accommodation of the telephone wires will be installed. The telephone instruments and wires will be furnished and installed by the New York Telephone Company.

Two of the three elevators will run from the basement to the roof, and the third from the sub-basement to the roof. The elevator machines will be located in the sub-basement at the foot of the elevator shafts. Each will be of the worm-driven drum type with direct-connected motor of about 20 hp which will drive the cars at a speed of 300 ft. per minute. The maximum load which each elevator will carry is 2,000 lb.

The sidewalk hoist is of the well-known platform type driven by a worm-propelled drum machine with direct-connected motor of about 5 hp.

Each of the ventilating fan motors will be driven by a motor capable of having its speed varied through rather wide limits by means of controllers provided with both armature and field rheostats.

Motors will also be installed in the service portions of the building for driving a silver polishing buffing lathe, a dish-washing machine, a dumbwaiter running from the tenth floor to the roof, a clothes-washing machine, an extractor and a mangle of the last three going into the laundry on the roof.

It is expected that this installation when completed will not only perform its various functions in a most satisfactory manner, but will also on account of its somewhat novel features, prove a very interesting adjunct to the new and magnificent home which Mr. Carnegie has so generously presented to the Engineers' Club of New York City.

The architects for the building are Messrs. Whitfield & King, whose designs were selected as a result of public competition, and who under the advice of the club's building committee have had much to do with the selection and arrangement of the various equipments, as well as the actual design of the building itself. Mr. Putnam A. Bates is the consulting engineer and has charge of all of the electrical machinery and equipments throughout.

Three to Six Transformation and Connections to Rotary Converters.

By Guy J. Reynolds.

IN transforming from three to six-phase current, there are three ways of connecting the secondaries of the transformers; namely, double Y, double delta and diametrical, with or without fixed neutral point. The primaries in either case may, of course, be connected either Y or delta, according to the pressure that each coil will stand, or to obtain a required secondary voltage. If the hexagonal voltage is not to be read, one transformer having at least three primary and three secondary coils or three transformers each having at least one primary coil and one secondary coil, are required. If the hexagonal voltage is to be read, there must be six secondary coils, or there may be three with central taps, and the method of connection must be diametrical.

Figs. 1, 2 and 3 represent, in the order named, the double Y, double delta and diametrical connection with fixed neutral point. In Figs. 1 and 2 the similar ends of the two coils of the same transformer or similar ends of any two coils bearing the same relation to a certain primary coil are at any instant of the same polarity. It may be seen that one set of three secondary coils are connected Y, or delta, in the ordinary way, but the leads from the second set are all reversed and then connected in a similar manner. This is done in order to obtain the proper phase displacement. In three-phase circuits, there are three coils with a phase displacement of 120 electrical degrees. In six-phase circuits there are six coils with phase displacement of sixty degrees. An armature coil must move through 180 electrical degrees from the position where the current begins to flow in one direction, before the current begins to reverse. Hence, if the ends of the transformer coils are reversed, the phase displacement of the current is in effect shifted 180 electrical degrees. From an application of this theory six-phase currents may be derived from three-phase transformers.

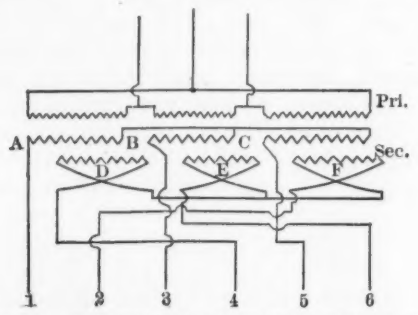


FIG. 1.—SECONDARIES CONNECTED DOUBLE Y.

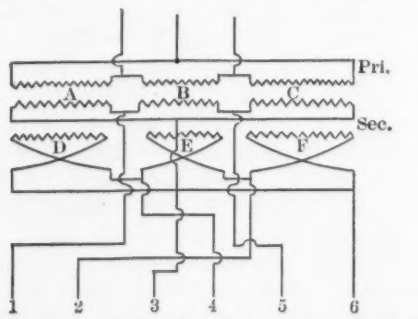


FIG. 2.—SECONDARIES CONNECTED DOUBLE DELTA.

Fig. 4 may assist in the graphical explanation of the phase displacement of sixty degrees. Let the heavy lines represent the waves of e.m.f. of the three-phase current taken from coils *A, B* and *C*. The currents, or e.m.f's, in coils *A* and *D* are in phase, considering similar ends of the coils, but if the connections from *D* are reversed, the phase relationship of the current will be changed 180 degrees with reference to that of *A*. Fig. 4 shows their new relationship by the use of sine curves. The wave of e.m.f. of the coil *D* is seen to be exactly in opposition to that of *A*. Now if coils *E* and *F* are also reversed, it may be seen from the Fig. 4 that there are obtained six waves of e.m.f. at sixty electrical degrees displacement.

In case it is desired to connect these six leads to a six-phase rotary converter it is necessary that each be connected to the proper rings. The connections must be so made that between rings 1 and 4, 2 and 5 and 3 and 6 there shall be diametrical voltages. Suppose the lines from coils *A, B* and *C* be connected to rings 1, 3 and 5. As has been stated, the e.m.f's of the opposite ends of similar secondary coils are 180 electrical degrees out of phase, hence the line from ring 4 should go to the actual opposite end of coil *D* from which 1 was taken from its similar coil, *A*. If ring 3 is connected to one end of coil *B*, then 6 would be joined to the actual opposite end of its similar coil, *E*. The remaining lead would then be connected to ring 2.

For the double Y or double delta connection, the secondary three-phase voltage taken from either of the two sets of secondary coils is determined in the usual way. Suppose a hexagon is inscribed in a circle whose radius equals to any scale the computed three-phase voltage divided by the square root of 3. If the six lines are now connected to the rings of a six-phase rotary converter, and the length of line, *A C*, in Fig. 5 represents to scale the three-phase voltage; the drop across any two adjacent rings as 1 to 2 will be represented by the length of line, *A B*. But *A B* is the side of a hexagon inscribed in a circle whose radius is *A O;* hence $A\,B = A\,O$. As the angle $A\,O\,C = 120$ degrees; $A\,B = A\,O = \frac{A\,C}{\sqrt{3}}$. The diametrical voltage 1 to 5, 2 to 4 and 3 to 6 each equals $2\,A\,B$.

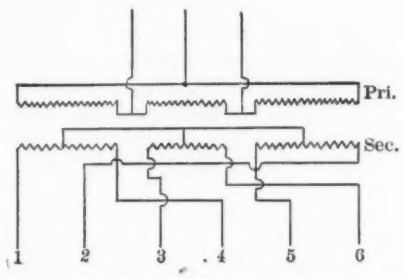
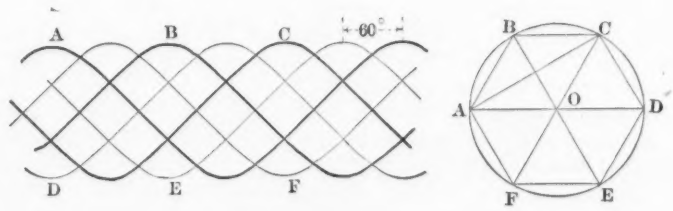


FIG. 3.—DIAMETRICAL CONNECTION WITH FIXED NEUTRAL POINT.

The diametrical connection shown in Fig. 3 is the one mostly used in practical work. By means of this connection the voltage can be read between any two leads before connections are made to the rotary collector rings. The diametrical voltage in this case is equal to the secondary coil voltage. Similar ends of the three coils go to rings 1, 3 and 5. The opposite ends of these coils are connected to rings 4, 6 and 2 in the order named. The neutral point is sometimes used in order to obtain a three-phase voltage for running a blower motor to cool the transformer coils, or to furnish current for running the rotary converter up to synchronism by an induction motor mounted on the same shaft. This three-phase voltage in this case would have a value equal to one-half the secondary coil voltage multiplied by the square root of three.



FIGS. 4 AND 5.—PHASE RELATION OF CURRENTS AND ELECTROMOTIVE FORCES.

Connecticut Railway & Light Company's System.

THE Connecticut Railway & Lighting Company lights Greenwich, Norwalk, New Canaan, Waterbury, Watertown, Naugatuck, New Britain, Plainville, Southington and Berlin, Conn. These towns are supplied from stations established at Greenwich, Norwalk, Waterbury and New Britain, the loads being apportioned as follows: The plant at Greenwich supplies electrical energy to Greenwich only; the plant at Norwalk also supplies New Canaan; the stations at Waterbury supply Watertown and Naugatuck in addition, while the remaining towns receive energy from New Britain.

The entire system was recently overhauled with a view to cutting down operating expenses, and as a result the old stations at Naugatuck and Southington were abandoned; the Norwalk station was vacated and the energy for lamps and motors supplied from the company's railway station at South Norwalk; the large steam station at Waterbury was practically abandoned and two new sub-stations erected which are supplied with high-tension current from Bulls Bridge; the steam station at New Britain as well as the railway plant at Mildale was also abandoned, substations being established at New Britain and Cheshire, which are also supplied from the Bulls Bridge plant. The overhauling also included a change from direct-current series arc lighting to alternating-current series arc lighting at Waterbury and New Britain, and a change over from 500-volt, direct-current for motor circuits to 200-volt, three-phase circuits, except in large installations where 400-volt is the potential of the supply.

The equipment at Greenwich consists of 600 hp in Babcock & Wilcox water-tube boilers and 975 hp in Ball high-speed engines. The generators are 125-cycle machines for incandescent lighting, Brush arc machines operating 5-amp., direct-current lamps for street lighting. The company also operate series incandescent circuits from reactive coil regulators and from tub transformers. The system is mostly overhead with the exception of a particular residential section of about a mile where the circuits are underground. The maximum load at Greenwich is about 295 kw. The base rate for lamps is 20 cents per kw-hour, subject to a discount of 10 per cent when under $20, 20 per cent when over $20 and under $100, and 25 per cent on all bills over $100. The base rate for motors is 15 cents per kw-hour, subject to the same discounts as for lighting. The amount of energy supplied for motor work is very small in Greenwich.

The Norwalk plant is equipped with 60-cycle monocyclic generators, the arc lamps being fed through reactance coil regulators. The maximum load is about 256 kw. The rate for lighting is 16 cents per kw-hour, subject to a discount of 5 per cent, and when the bill amounts to over $10 10 per cent. The base rate for motor circuits is 10 cents, subject to the following discounts: On bills of $1 to $25, 10 per cent; on bills of $25 to $50, 20 per cent, and on bills of $50 and over, 30 per cent. Both the Greenwich and Norwalk plants are old, and while the connected load is steadily increasing, the stations cannot be said to be very progressive. The Norwalk plant does not supply electrical energy for any service whatever in South Norwalk. In the latter city a municipal plant is in operation and the rates are much cheaper than those of the Norwalk plant.

At Waterbury the company has installed the most modern equipment and the management is very energetic. The entire output of the hydro-electric station at Bulls Bridge on the Housatonic River is transmitted to sub-station No. 1 of the Connecticut Railway & Lighting Company at Waterbury, and through Waterbury to New Britain and Cheshire, the latter sub-station being devoted exclusively to railway work. The hydro-electric station at Bulls Bridge has the distinction of being the largest electric generating station using water power in New England. It possesses the highest head of water, the highest transmission voltage and the longest transmission line of any of the many stations in New England. Two three-phase transmission lines run from Bulls Bridge to sub-station No. 1, which is located on the west bank of the Naugatuck River on the outskirts of the city of Waterbury. Each of these three-phase circuits is made up of three bare aluminum wires having a conductivity equivalent to No. 00 copper. Energy delivered to the line at Bulls Bridge at about 33,500 volts reaches sub-station No. 1 at Waterbury over 30 miles distant with a loss ranging from 4 per cent to 7 per cent, depending on atmospheric conditions. Transformers at this station reduce the voltage to 2,300 for overhead transmission through Waterbury to sub-station No. 2, situated in the center of the town. Current at a potential of 33,000 volts is also transmitted through sub-station No. 1 to New Britain and Cheshire as already mentioned, thus giving a transmission circuit over 40 miles long. The high-tension lines are carried in duplicate and on separate pole lines from Bulls Bridge to Waterbury, and the lines from Waterbury to New Britain are also in duplicate, but are carried on a single pole line.

The equipment in sub-station No. 1 consists of four 500-kw rotary converters, one 48-kw booster, four 550-kw, 33,000-volt, 60-cycle transformers with their reactance coils, eight motor-driven, high-tension oil switches, two motor-driven blowers, six single-phase transformers, six arc light transformers, a railway storage battery and an auxiliary storage battery, together with controlling switchboards. The transformers are all of the air-blast type, the primary and secondary voltages of the 550-kw units being 33,000 and 430, respectively. The primary and secondary voltages of the single-phase transformers are 33,000 and 2,300, respectively. The current from the rotaries is used entirely for railway purposes, the maximum load of which is 2,500 amp., which comes on at noon.

The six 500-kw transformers are arranged in banks of three and the 2,300-volt secondary current obtained from them is transmitted over two separate trunk lines of No. 000 copper to sub-station No. 2. The six constant-current transformers are used for series arc lighting; single-phase arc lighting circuits running to Naugatuck, North Willow and Highland Park, Waterville, East Waterbury, North Waterbury and Forest Park, Watertown, South Waterbury and Platt's Mills. The line to Watertown has a straight run of six miles before distribution is made. A three-phase feeder line also runs to Naugatuck, where it is split up into three single-phase circuits. The lighting load fed from sub-station No. 1 consists of about 450 series arc lamps and about 30,000 incandescent lamps.

Sub-station No. 2 is somewhat smaller in size and equipment than the sub-station just described. The equipment of the station consists of four 300-kw rotary converters, four 300-kw three-phase transformers and controlling switchboard and apparatus. The converters deliver direct current at 275 volts, which is utilized entirely for lamp and motor circuits operated on the Edison three-wire system. The territory fed by the station is about one mile square and the station is at about the center of the load. Overhead and underground distribution are both in vogue. The commercial multiple arc lamps connected number 900 and the incandescent lamps number over 25,000. The load in Waterbury was previously carried by a steam-driven central station on Bank Street bordering on the Naugatuck River. This station is now maintained as a reserve in case of any accident to the transmission plant at Bulls Bridge.

Up to within the last two years the management at Waterbury had never been in a position where it could accept new business; in fact, business was being constantly refused. With the establishment of the two new sub-stations with ample capacity and the consequent economy of production and operation, the company was finally enabled to accept new business which by a little canvassing came pouring in faster than was ever anticipated. The base rate for lighting is 15 cents per kw-hour, subject to a discount of 10, 20 and 30 per cent, according to the amount used, with a minimum bill of $1 per meter installed. The rate for motor power is 10 cents per kw-hour, which for amounts of $3 and under is net. For bills amounting to over $400 a discount of 25 per cent is allowed on this rate, the minimum for motor circuits being $1 per month with no charge for readiness to serve. The maximum load at Waterbury is about 2,157 kw. The New Britain station is similar to, but not so large as, the Waterbury sub-station No. 1. The maximum load is about 570 kw. The rates for energy for lamps and motors are the same as at Waterbury.

The company employs canvassers in the four districts and their work is directed and supervised by a business agent. Advertisements are carried in the local papers, but no literature is printed or distributed directly by the company. The company is controlled by the United Gas Improvement Company, of Philadelphia, so that it has no gas competition where gas plants operated by this company or by the Connecticut Railway & Lighting Company itself are installed. Gas competition is only met with in Waterbury and New Britain; in the former city it does not amount to much, but in New Britain there are quite a number of gas "arc" lamps installed. No attempt has been made as yet to fight this competition because the company has only recently been in a position to supply enough electrical energy to meet the legitimate demand and the growth is such as to permit gas competition to go unheeded for a season at least. An unostentatious show room is being maintained at Waterbury as an experiment, and if the results are at all promising the show room will be made permanent and more prominent with the possibility of show rooms being established in the other districts.

Free lamp renewals are made in all the stations with free first installations, also for all standard lamps. Meters are tested every six months, and complaints on account of service are carefully investigated and defects remedied as soon as possible. Where consumers feel aggrieved over the amount of the lighting bill a test is made of the meter in the presence of the customer if that be possible, and any errors in the meter are frankly acknowledged and the necessary allowances made. The working of the meter is also carefully explained to the customer at the time this test is made. In the matter of signs, the company had not many of any consequence until within the last six months. Waterbury does a very large sign business and there are also some signs maintained in New Britain. The company furnishes the sign and does all the work of installing it gratis on a guaranteed minimum consumption of electrical energy which varies with the different types of signs. With the No. 108 Federal sign the minimum bill is $2.50 per month; letter signs are charged a minimum bill of $1 per single face letter per month, and $2 per month per double face letter. All of this work is in the hands of the business agent and is billed at meter rates, there being no flat rates for this class of service or in fact for any class of service in the entire system. During the past year there has been a marked increase in the sale of electricity over the entire system. The records show that the increase during 1905 over 1904 was 19 per cent in Greenwich, 10 per cent in Norwalk, 10 per cent in New Britain and 40 per cent in Waterbury. This large increase at Waterbury is not the result of any special canvassing. Waterbury is a large and enterprising manufacturing city and a demand for electricity has existed there for some time, but as already pointed out the Connecticut Railway & Lighting Company was not in a position until recently to satisfy this demand. The officers of the company are as follows: A. M. Young, president; D. S. Plume, first vice-president; G. E. Terry, second vice-president; L. Lillie, secretary and treasurer; E. W. Poole, assistant secretary and assistant treasurer; W. Clark, managing director; J. A. Pearson, purchasing agent; J. E. Sewell, general manager; C. F. Bryant, auditor, and W. T. Oviatt, chief of the electrical department.

Recent Electrochemical Developments.

ELECTROLYTIC LEAD SMELTING.

Electrolytic lead refining with an aqueous solution of lead fluosilicate, containing an excess of fluosilicic acid (Betts' process) is now successfully established on a commercial scale. Besides the old original plant in Trail, British Columbia, a second plant was installed last year in New Castle-on-Tyne in England, while a third large plant is now about to be opened near South Chicago by the U. S. Mining, Smelting & Refining Company which also owns the DeLamar Copper Refinery. The Betts process of lead refining is entirely analogous to copper refining in so far as the process relates to a finishing reaction only, the product being a metal of great purity.

The bigger problem—the reduction of metallic lead from ore especially from galena—has also attracted numerous electrochemical inventors. The Salom process of reducing lead by making comminuted galena the cathode in an electrolyte of sulphuric acid has been used for some time at Niagara Falls on a large experimental scale, but has apparently not achieved commercial success. On the other hand five inventors have recently brought out processes using a fused electrolytic bath. One is C. P. Townsend whose patent on this subject was recently abstracted in these columns; second, James Swinburne and E. A. Ashcroft in England; third, Anson G. Betts and W. Valentine, to whom patents were recently granted in this country.

The Betts-Valentine process consists essentially of two stages; first, fusion of the ore into matte high in lead sulphide, to get rid of lime, alumina, silica, etc.; and second, electrolytic reduction of the fused matte under such conditions that the iron remains as a sulphide and does not contaminate the reduced lead or clog the bath. The bottom of the electrolyzing cell contains molten lead which forms the cathode. Above the cathode a layer of the molten matte is kept and above the matte a fused electrolyte in which lead sulphide is substantially insoluble, preferably sodium chloride containing sodium sulphide. A carbon anode dips into the fused electrolyte.

On passing a current of electricity through the cell, chlorine is liberated at the anode unless sufficient sulphide is dissolved in the electrolyte when sulphur is liberated instead of chlorine. The sodium ion appearing at the cathode reacts with lead sulphide, giving metallic lead and sodium sulphide. The sodium sulphide formed partly dissolves in the matte and partly in the electrolyte and accumulates therein, until eventually pure sulphur is given off at the anode. The evident advantages of such an electrolytic lead smelting process are that there is no loss in lead and that practically all the sulphur is recovered.

Another patent recently granted to A. G. Betts refers to the construction of an electric furnace which he considers specially suitable for this purpose. The principal feature of this construction is that the electrodes are not placed in the smelting zone itself but in separate conduits which are in connection with the smelting zone; the fused electrolyte being circulated through this conduit by means of an electromagnetic stirring device (somewhat similar to that recently employed by E. A. Ashcroft for analogous purposes). A full detailed description of the Betts process, with thermochemical calculations, has been given by the inventor in the May issue of *Electrochemical and Metallurgical Industry*, which also contains an article by E. A. Ashcroft on his own and Swinburne's work in the same field.

CALCIUM CARBIDE.

Seven patents recently granted to H. L. Hartenstein are interesting, as they refer to a process of manufacturing calcium carbide and to furnace constructions by which the Union Carbide Company is to receive competition for the first time in this country since the process of Hartenstein is reported to be in operation in a Western plant. The object is to produce a carbide having a comparatively hard stone or flint-like structure which is not objectionably porous and not nearly so hygroscopic in its nature as the crystalline product and which during crushing does not yield so large a percentage of fines. The carbide is made directly from limestone by pre-heating to calcine it, then mixing coke with the mass while highly heated and fusing the mixture in an electric furnace. The furnace is tapped and the molten mass run off into chilled molds to separate out into a comparatively thin sheet whereby it is enabled to cool quickly. Simultaneously a protective coating is applied to the carbon of such a material as coal-tar, glucose, etc., these materials being applied to the surface of the molds.

MISCELLANEOUS FURNACE PATENTS.

T. L. Willson reduces calcium oxide mixed with carbon in an electric arc furnace, the carbon crucible serving as one electrode. The reduced metallic calcium may alloy or combine with some other metal if the same is provided in the charge and may combine with an excess of carbon to form a carbide. The application for this patent was filed January 28, 1896, so that more than ten years elapsed before it was granted.

M. Ruthenburg has recently been granted another patent on his well-known treatment of comminuted iron ore. As will be remembered, the concentrates from magnetic separators are passed between rolls across which the electric current is passed, and thereby fritted together so as to form lumps. These lumps fall into a reservoir below where it is intended to reduce them (without fusion) by means of a reducing gas from a gas producer. The reduced iron then passes into a region at fusing temperature where it is melted and drawn off.

A furnace recently patented by C. O. Wingren is intended for fusing quartz in such a way that when it cools the fused quartz is free from air bubbles.

A patent of E. Zell refers to muffle furnaces in which the heat is produced by passing an electric current through the iron walls of the muffle. In order to protect the iron walls against corrosion he packs them in granular calcium carbide.

Two patents, recently granted to D. G. Steinecke and J. F. Hammond, respectively, refer to details of construction of electric furnaces for dental work.

New Telephone Patents.

SWITCHBOARD CIRCUITS.

In Fig. 1 there is shown a new switchboard circuit system which is extremely simple in its operation. The compound line relay, responding to a switch hook, will connect the line lamp in series with the resistances *e* and *f*, thus causing it to glow.

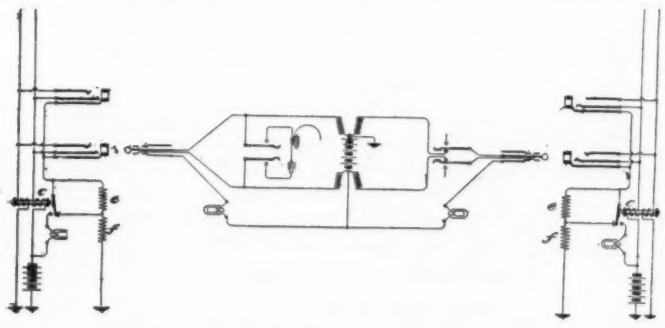


FIG. 1.—M'BERTY SUPERVISORY SIGNAL.

Now upon the response of an operator, the supervisory lamp, which is of low resistance, shunts out the line lamp. It does not itself light because of the proportions of the various resistances. Now when the line relay armature is released the supervisory does light as the resistance, *e*, is cut out of its circuit. Mr. F. R. McBerty, of Evanston, Ill., has obtained the patent for this system, his patent being assigned to the Western Electric Company.

Mr. J. Kellogg, of Chicago, has obtained a patent for a circuit system for a switchboard designed to accommodate and interconnect grounded and metallic lines. The system was probably of more value at the date of application for the patent, 1891, than at present. The system hinges on a polarized drop, or a drop and coil, with a ground as the neutral point, and test batteries, one in each cord circuit, to provide a busy test. The Kellogg Company has obtained the patent by assignment.

JACK BOX.

There are numerous present day uses of the telephone which require a portable telephone adapted to be readily connected to a telephone line at intervals throughout its length. The plug and jack form the usual connection. It has disadvantages, for if the jack is stationary insects and dirt collect in it, while if the jack is portable, the weight of its mounting is too much for the cords.

G. H. Metheany, of Lima, Ohio, has produced a novel jack box, the plug aperture of which is normally closed by a metal ball. The box is arranged so that the plug is inserted from the bottom. The inner surface of this bottom is recessed toward the plug aperture and the ball, free to move, recedes ahead of the plug, and runs back into the aperture as the plug is removed.

FUSE AND ALARM.

In Fig. 2 is shown an improved fuse and alarm, the invention of E. B. Craft, of Chicago. The fuse, it will be noted, holds the

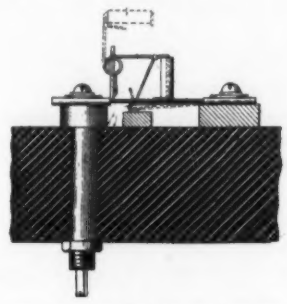


FIG. 2.—CRAFT ALARM FUSE.

alarm spring off the alarm bus-bar and at the same time holds an indicator in the non-operative position. When the fuse blows the battery bus is connected to the alarm and the indicator is thrown up as shown by the dotted lines.

SERVICE REGISTER.

C. E. Wright, of Cleveland, Ohio, has obtained a patent for an apparatus for registering the quality of service given by an operator. The register indicates time of call, plug-in connection, disconnection, etc., automatically, comparing these with the stroke of a timing pendulum or other timing device.

TELEGRAPH SYSTEM.

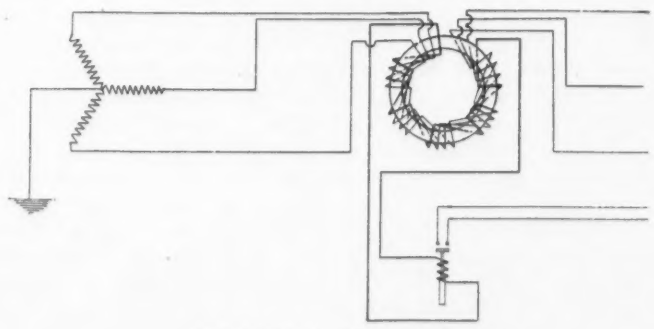
M. J. Carpenter, of La Grange, Ill., with the idea of making telegraph signals inaudible except to the operator, has combined the telegraph and telephone. In one scheme he mounts a dummy telegraph key on the base of a telephone set, the transmitter of which picks up the various clicks. In another variation the telegraph key contacts are included in the telephone transmitter circuit.

MESSAGE CHARGE INDICATOR.

A message charge indicator has been patented by I. Kitsee, of Philadelphia, by which at the end of a call the operator may indicate mechanically to the station what are the charges. A contact dial is used by the operator, an arm sweeping over the proper number of contacts causing the synchronous action of the subscriber's register to indicate the cost of the call.

Ground Detector for Polyphase Circuits.

A patent issued April 24 to Mr. G. N. Eastman describes an automatic safety device for polyphase systems, which is placed



EASTMAN GROUND DETECTOR.

in operation when one of the conductors becomes grounded. The leads from the polyphase generator, the neutral point of

which is grounded in the usual manner, are wound around a laminated iron ring in such a manner that each will have the same inductive effect upon the core as the other. An independent conductor is also wound around the core in such a manner that any magnetic flux therein will generate an electromotive force in this conductor. In normal operation no flux will be produced in the core, since the instantaneous sum of the currents in the lead wires is zero. Even in a three-phase system when current flows in only two of the main conductors, the instantaneous resultant sum of the currents is zero. As soon as a ground occurs, however, part of the current fed through the transformer will return to the generator through the ground and thus destroy the balance in the current transformer. The unbalance will cause a magnetic flux to be set up in the core, which will in turn energize the winding in the independent conductor, thus operating a circuit-breaker or some form of current indicator.

The Lighting of Streets.

At the May meeting of the Illuminating Engineering Society, held on May 11, three papers were read on the general subject of street illumination. A paper by Mr. Western Underwood and Mr. V. R. Lansingh dealt with a method of street lighting by incandescent lamps. High-efficiency incandescent lamps for street lighting were treated by Mr. F. W. Willcox, and the lighting of streets by incandescent-mantle burners was the subject of a paper by Mr. F. Westermaier.

The paper of Messrs. Underwood and Lansingh described the street lighting system used in Los Angeles, Cal. It consists of ornamental poles placed on an average of 100 ft. apart, each pole being directly opposite the one on the other side of the street. The lamps are all placed upright, which, while undoubtedly not quite so efficient as if placed in a pendant position, nevertheless renders the liability to breakage less, and in case of breakage protects the passer-by from falling pieces of glass. The center ball used on the type of post employed along Broadway of that city is of ground glass, roughed on the inside, 18 in. in diameter, containing six 32-cp lamps in two tiers. Surrounding this are six eight-inch balls with one 32-cp lamp in each. All lamps burn from dark until midnight, after which hour the lamps on two of the four posts at corners of the streets are left burning. The voltage is 110. One of the difficulties in the first installation was the effect of the sun in the day time rendering the iron posts so hot as to cause trouble with the rubber-covered wire used. This has been rectified since by the substitution of asbestos-covered wire.

In all there are 134 posts on Broadway, covering a distance of 10 blocks in the heart of the business section. The cost of each pole set up complete was $100.

The type of post adopted for Spring and Main Streets has four arms with 12-in. roughed-inside balls with three 16-cp lamps in each, and one large center ball 16 in. in diameter with six 32-cp lamps. On Spring Street there are 134 of these posts, and on Main Street 164.

The illumination of the streets is remarkably uniform. In no case is the lighting really brilliant but the lighting is extremely good and very easy on the eye. The advantage gained in this respect by using roughed-inside balls is very considerable. Where the globes have been broken and the bare lamps are visible, the trying effect on the eyes is extremely noticeable; and while there is undoubtedly a reduction in the total amount of light, the ability to see well is greatly enhanced by the use of these balls. At the same time they make an extremely ornamental and dignified appearance, with the result that the amount of business on the streets so lighted has, it is claimed, been greatly augmented.

There is very little halation, and the light at all points is remarkably uniform. It is possible to stand half way between the posts and read the print of an ordinary newspaper, even when placed horizontally. When held normal to the light a newspaper can be read with ease.

One of the objections to the system is that too much light is thrown upward, and that therefore the system is not as economical as might be desired. Experiments are now being undertaken to see if it is possible to overcome this defect. If this can be done, an increased illumination can be given in the street at the expense of some of the upward light; or as the illumination of the street is ample at present, it will probably result in a reduction of the current used, by employing lamps of smaller candle-power.

The chief objection to the system is the cost of operation. As installed in Los Angeles, the consumption is practically 12 amperes at 110 volts per post; this means 12 amperes at 110 volts every 50 ft., or practically the cost of operating one arc lamp of six amperes every 25 ft., which is high. The results, however, from every other standpoint are very good.

The paper by Mr. F. W. Willcox dealt specifically with the General Electric graphitized filament lamp as applied to the lighting of streets. After discussing the advantages of using many lamps of low candle-power distributed over a considerable area rather than a small number of lamps of high candle-power separated by great distances, the author described briefly the improvements which have been introduced in the apparatus for supplying current to series lighting circuits. He considered that the best systems at the present time is one using constant-current transformers with high-efficiency incandescent lamps, each being equipped with a reliable device to short-circuit the fixture if the lamp should burn out. The graphitized filament lamp, which costs very little more than the ordinary carbon-filament lamp, is about 30 per cent more efficient for the same total life. On account of the higher temperature at which these lamps are operated, their brilliancy is satisfactory after they have lost more than 20 per cent of their initial candle-power. This result is attributable to the fact that only about 20 per cent of the loss of illumination is due to the blackening of the globe, the remaining 80 per cent being due to the change in the resistance. The author suggests that the lamps used in series for street illumination should be burned until the candle-power decreases to 75 or 70 per cent of its initial value, in which event the life will be many times greater than when the lamps are discarded after the illumination has dropped to 80 per cent. By making certain assumptions as to the cost of energy and the initial cost of the lamps, it was contended that for almost all kinds of street service the 2.7-watt lamp is the most economical. It has been found that the lower the current for which the lamps are designed the more satisfactory will be the performance. For best general service the e.m.f. of the series circuits should be from 3,000 to 5,500 volts, the current from 1.5 to 5.5 amperes, the rating of each lamp from 20 to 50 candles. More than 90 per cent of all lamps in use are rated below 40 candles; perhaps the standard unit should be a low-current 25-cp lamp.

For street illumination, the high-efficiency incandescent lamps should prove especially advantageous to central stations, on account of the fact that the income from street lighting is based on the lamp-hour and not on the kw-hour, and any saving in energy without decrease of illumination means a direct increase in the profits. In comparing the high-efficiency incandescent electric lamp with the incandescent-mantle gas lamps, the author stated that it permitted more readily of economic control, its initial cost is less and its maintenance cheaper; it withstands the weather more advantageously, and, on account of the fact that its location is not limited by the position of gas mains, it can easily be installed so as to afford any desired distribution of illumination.

In his paper on the lighting of streets by incandescent gas mantles, Mr. Westermaier stated that, in order to withstand the rough usage on the streets it has been found necessary to construct a mantle especially for street lighting purposes. These mantles are strong in structure, and, owing to special treatment and preparation, retain their efficiency longer than the average commercial mantle. The mantles are capable of producing from 20 to 24 candle-hours to a cubic foot of gas having a thermal value of 600 British thermal units; while, with gases of higher heating value, such as natural gas, the illumination rises to over thirty-five candle-hours to the cubic foot. In dealing with natural gas it is necessary that the mantle be specially treated to prevent the percentage of cerium

being reduced. This treatment is most important, as without it the mantle loss would be very high and the service would not be efficient.

The intense illumination such as that produced by the electric arc lamps, is neither desirable nor necessary in residential sections of cities. The incandescent-mantle lamp diffuses its light over these sections to much better advantage. The most judicious arrangement of lamps is obtained when the broad avenues are lighted by arcs, while the cross streets and parks are lighted by mantle lamps.

In order to maintain the efficiency of the incandescent gas street lighting system, it is absolutely necessary that the lamps receive proper care and attention. As each lamp is in itself an individual plant, it must be adjusted to suit the conditions under which it operates. There is no doubt that the best possible service is to be had only where each individual lamp receives daily attention. Manual lighting will therefore not be replaced by the automatic unless great improvements are made. Moreover, the majority of automatic devices could not be used even if they were perfected.

DISCUSSION.

The discussion was opened by Mr. J. W. Cowling, who compared the illumination obtained from arc lamps spaced at great distances with that from small lighting units more widely distributed. In towns and small cities the best effects are secured by the use of 25-cp incandescent lamps, and in many places such lamps have replaced the electric arcs. He expressed the opinion that the initial cost of the equipment and the expense for the electricity used in the Los Angeles street lighting system were very excessive.

Mr. W. T. Morrison gave an account of the good results which had been obtained by selecting lamps of varying amperes for use in different parts of a lighting system. In discussing the Los Angeles installation, he remarked that it is unnecessary to place lamps in an upright position on posts in order to prevent breakage, because experience shows that almost no breakage occurs when the downward arrangement is used, while the latter method is far preferable with reference to the illumination obtained. He criticised the use of only two lamps at street corners 600 ft. apart after midnight in the business section of a town. The power used in the Los Angeles equipment amounts to about 26 kilowatts per 1,000 ft. of street, while along Fifth Avenue, in New York City, which is considered one of the best illuminated streets in the country, only 6.6 kw are used per 1,000 ft. The cost, therefore, must be extremely high in Los Angeles.

Mr. E. L. Elliott remarked that the lamp posts used in Los Angeles seemed to have been designed with especial reference to the handsome appearance and that incidentally they were used for holding electric lamps. From the point of view of illumination it would be difficult to conceive of a less efficient arrangement. The use of several incandescent lamps in a single globe is fundamentally wrong, and clusters of lamps are always disadvantageous with reference to the distribution of the illumination. No attempt seems to have been made to prevent the fixtures and the lamps themselves from cutting off a large part of the light, and yet no reflectors have been used. It would have been far better if the lamps had been placed in a downward position.

Mr. W. D'A. Ryan showed that the so-called reflectors used with street lamps serve well enough as a protection from the weather, but that they are failures as means for directing the light rays where they are needed. A reflector should collect the major portion of the light rays which tend to pass above the horizontal and re-direct them to an angle between 0 and 20 degrees below the horizontal. Such reflectors seem never to have been used, although their design offers no difficulties whatsoever.

Mr. F. W. Westermaier stated that in certain tests which had been conducted to determine the effectiveness of the illumination obtained from different types of gas and electric lamps, it had been found that a clipping could be read at a much greater distance from a gas lamp than from an electric lamp of the same candle-power rating.

Mr. T. J. Little, Jr., in discussing the rating of incandescent-mantle gas lamps, stated that numerous tests made on lamps in actual service showed that about 20 candle-hours are obtained per cubic foot of gas, so that a 3 cu. ft. burner can safely be rated as a 60-cp lamp. By the use of the proper reflectors the distribution of illumination from gas lamps can be rendered equally as satisfactory as that obtained from electrical lamps.

Mr. John Campbell said that it is not proper to judge of the illumination from lamps by the distance at which a clipping can be read, and that the only proper method is by the use of photometers.

President L. B. Marks thought that the subject of street illumination is of sufficient importance to justify the appointment of a committee to collect data or to make such tests as may be needed in order that more definite information may be available for the members. He suggested that the matter of selecting such a committee be referred to the council of the society.

LETTER TO THE EDITORS.

Soldering Fluxes.

To the Editors of Electrical World:

SIRS:—Serious charges have from time to time been preferred against linseed oil and the various gums used in the manufacture of insulating varnishes, by persons interested in the promotion of petroleum base compounds, and practically all the failures of electrical apparatus whose causes were not immediately apparent, have been conveniently laid at the door of the insulating varnish. An insulating varnish is not a perfect material at the present stage of its development although it has been improved very materially in the last ten years as a direct result of the rivalry of the various varnish makers to secure the business of the electrical trade whose demands as to quality have been increasingly exacting.

The writer having had occasion to investigate the charges referred to above, concluded, after considerable experimentation extending over several years and after discussing the matter with many of the most notable authorities on insulation, it would be necessary to look elsewhere for an explanation of practically all the failures of electrical apparatus arising from obscure causes.

Probably one of the principal causes of these failures is the use of soldering fluxes which are absolutely unfit to be associated with other materials accessory to the manufacture and repair of the apparatus. It is astonishing to note the carelessness and apparent indifference with which many manufacturers and the large majority of central station managers treat this small but extremely important article.

The fluxes used to solder joints which are afterward insulated, very often contain zinc or ammonium chlorides in large quantities which are anything but dielectrics and the former is strongly hygroscopic; not only are they conductors electrically, but they act chemically on the insulation, rapidly deteriorating both textile and insulating coatings with uniformly disastrous results. The corrosive action of these chlorides whether alone or compounded with other materials makes their use impossible for soldering all small gauge wires whether bare or insulated. A test recently brought to the notice of the writer strongly indicates the necessity of abandoning the use of all flux compounds containing metallic or other corrosive salts in the vicinity of insulation; on tearing down a multiple strap-wound coil that had had a terminal soldered to its starting end, it was found that the zinc chloride flux had, by capillary attraction, penetrated the coil over a foot from the soldered joint! Such a condition is liable to be obtained constantly in practice, is the probable cause of many obscure breakdowns in high-tension apparatus and should be forestalled by absolutely prohibiting the use of fluxes other than those composed exclusively of insulating materials.

The specification just named excludes the use of water solutions. The fire risk accompanying the use of spirit solutions, not to mention the inconvenience of the brush and cup method

with its unavoidable waste caused by carelessness and evaporation of the solvent, is a factor to be seriously considered.

A soldering flux for general electrical use should, therefore, be in stick or paste form, preferably in stick form for convenience in handling, of sufficiently high flashing point to prevent its taking fire on contact with hot solder, and should contain none but insulating materials.

Elgin, Ill. L. Dwight Conger.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Dynamos, Motors and Transformers.

Single-Phase Commutator Motors.—Hospitalier.—The first part of a long article intended to give a classification and general theory of single-phase commutator motors with the aid of diagrams.—*L'Ind. Elec.,* April 10.

Single-Phase Motors.—Perret.—A note discussing some theoretical points concerning perfect commutation in single-phase commutator motors.—*L'Eclairage Elec.,* March 24.

Windings.—Goerges.—A long abstract of a paper read before the Dresden Electric Society on the classification of direct current dynamo windings and the principal laws governing them.—*Elek. Zeit.,* March 22.

Transformers.—Dalemont.—A highly mathematical note on determining the phase-difference in transformers.—*L'Eclairage Elec.,* April 7.

Calculating the Coefficient of Self-Induction.—Rosskopf and Wittek.—Several letters discussing some special points in the recent article of Wittek on the calculation of the coefficient of self-induction of coils embedded in iron.—*Elek. Zeit.,* March 22 and April 26.

Lamps and Lighting.

Tungsten Lamp.—Ross.—An abstract of a paper read before the Austrian Assoc. of Electricity Works. The author gives a review of the different firms and engineers which are trying to develop the tungsten lamp and molybdenum lamp. Just has two patent applications for two different methods of preparing tungsten and molybdenum filaments, of which the first one is stated to have met with difficulties while the second one is as follows: Compounds of tungsten or molybdenum which can be reduced to the metallic state by means of hydrogen (for instance, oxides, sulphides, chlorides) are powdered and mixed with a binding material which is free from carbon (for instance, water) and made into a plastic mass. This is brought into the form of a filament and is heated in a hydrogen atmosphere until the filament is reduced to the metallic state. Entirely different methods are those of Kuzel, who employs colloidal solutions and the paste method of Welsbach. The Welsbach Company is also working in this field, and its method is to treat the trioxides of tungsten or molybdenum with an excess of ammonia so as to form a tough paste and to work this upon filaments. Concerning the Kuzel lamps some tests have been made in an Institute in Vienna which were mentioned in Electrical World February 17, p. 354. The testing laboratories of the municipal Electricity Works of Vienna have so far examined only tungsten lamps of the Welsbach Company. The tests have not yet been concluded, but the results obtained so far with lamps lighted for about 1,000 hours are favorable. Up to the present only the Welsbach Company has furnished lamps consuming one watt per cp with voltages of from 100 to 120. The hall in which the lecture was held was lighted with such lamps of 60 to 80 cp, which gave a light which was specially pleasant by its beautiful white color. Such lamps may stand a considerable increase of voltage, as was shown by the lecturer who used one of the lamps at double the normal voltage.—*Elek. Zeit.,* April 12.

Tungsten Lamp.—A note on the new tungsten lamp of Just and Hanaman. So far the lamp has been made for voltages not exceeding 110 volts. In the 110-volt, 32-cp pattern, there are three exceedingly thin filaments of pure tungsten, the filaments being held in place by suitable stays of aluminum oxide or of a mixture of other suitable oxides. In size and form the new lamp is stated to be almost identical with the ordinary 110-volt, 32-cp carbon-filament lamp. According to the inventors, pure tungsten cannot be made to melt, but at the highest temperatures obtainable it volatilizes without passing through the liquid state. In this respect it is analogous to carbon, the difference being that the temperature at which carbon volatilizes is considerably lower than that for tungsten. It is stated that the average life of a 110-volt, 40-cp lamp when run at an illumination of one Hefner candle per watt is 1,500 hours. It would appear that the illuminating power of the lamp remains unaltered during its entire life, and that it is not at all sensitive to fluctuations in the supply pressure.—*Lond. Elec.,* April 27.

Improving the Light of the Mercury-Vapor Lamp.—Gehrcke and von Baeyer.—An account of an investigation made in the German Reichsanstalt. In order to produce red rays in the mercury-vapor lamp and thus improve the color of its light, the authors add zinc to the mercury. They use a lamp made from fused quartz with zinc amalgam containing 30 parts by weight of mercury for 100 parts of zinc. The spectrum shows not only the strong mercury lines 435.9, 546.1, 576.9, 579.0, but also the strong zinc lines 468.0, 472.2, 481.1, and 636.4 $\mu\mu$. Especially the last named red zinc line is very strong. The lamp was operated on a 110-volt circuit with a series resistance and its light was much more like ordinary daylight than the light from a lamp containing pure mercury. A stick of sealing wax appeared red and the human skin lost the deadly green color which it had when illuminated by the mercury lamp, and appeared rather a little too rosy. Only the color of yellow substances was incorrect, since they appeared either too red or too green. This last disadvantage was overcome by adding a small amount of metallic sodium and the light given out from the mercury-zinc-sodium lamp was then comparable to the color of some Bremer arc lamps. It is advantageous to add to the above mixture some bismuth (say about 10 per cent) since it happened that the zinc amalgam which is solid at ordinary temperature, when expanding with rising temperature, sticks to the walls of the lamp and made them crack. No cracking occurred after bismuth had been introduced while the spectrum of the bismuth is much too faint to change the color of the lamp in any considerable degree. The quartz lamp used in the experiments was designed for spectroscopic purposes only, and would not be suitable for commercial use. For this reason, and because the lamp needs further improvements before it can be made commercial, no data are given on the economy of the lamp.—*Elek. Zeit.,* April 19.

Power.

Direct-Current Power Transmission.—Adams.—With reference to the proposed direct-current power transmission from Victoria Falls to the Rand in South Africa the author points out the following advantages of this system: For equal effective voltages, the maximum voltage of a single-phase or two-phase alternating-current circuit is 1.41 times that of a direct-current circuit. In a three-phase circuit the maximum alternating voltage is higher by a large percentage than the voltage of a direct-current circuit for the same power and loss and weight of conductors. For these reasons the constant silent escape of energy from wire to wire of a transmission circuit is greater with alternating current than with direct current. In a direct-current transmission line the maximum voltage is on the line only at times of full load; at other times the voltage is proportional to the load. The line construction is simpler with direct-current than with three-phase current, and for a given weight of conductors per mile a direct-current circuit presents a stronger construction than a three-phase, because each wire is larger in the former case than in the latter.—*Cassier's Mag.,* May.

Power House Economics.—Hancock.—The conclusion of his article on the importance of details of operation in power

houses. There should always be a sufficient number of each kind of tools on hand to admit of having others repaired without excessive cost. The supplies should be kept in a suitable place. Good care for the steam and electrical apparatus involves tests every month of the reciprocating engines or steam turbines, etc. To keep the auxiliaries in proper working order, labor and material of first-class kinds are necessary. The instruments should be periodically tested and standardized.—*Cassier's Mag.*, May.

Alternating-Current Motors.—SCOTT.—The second part of his illustrated article, of a general nature, on speed characteristics and the control of electric motors. In the present installment he discusses alternating-current motors.—*Eng'ing Mag.*, May.

Traction.

Vienna.—A note on the electrification of the Vienna City Railway. Motor cars cannot be used since it was required that at the terminals of the city road passengers should not be forced to change cars when going out of town on any of the suburban steam roads. In the city road electric locomotives have therefore been installed, the Krizik three-wire system being used. Each direct-current locomotive has two axles and four motors, two motors acting on one axle. Two such motors are in series and are connected across one-half of the three-wire network of 2x1,500 volts. The other two motors are connected across the other half. The earth forms the neutral conductor and generally carries no current on account of symmetric load. An exception is in starting which is accomplished with the four motors in series at 1,500 volts. With a tension of 3,000 volts two converter stations are sufficient for the whole city road; they are supplied with three-phase currents from the municipal electricity works. The locomotives for trains of from 5 to 10 cars weight 29 tons, the draw-bar pull being 8,300 kg. The ratio of adhesion weight to draw-bar pull is 3.5, which is the same ratio as for the new Valtellina road.—*Elek. Bahnen*, March 3.

High-Tension Direct-Current Railway.—An illustrated description of the 990-volt, direct-current railway between Cologne and Bonn in Germany, the motors being provided with interpoles. The chief features of the road were noticed and illustrated in the Digest of April 28.—*St. R'y Jour.*, May 5.

Single-Phase Railway at the Milan Exposition.—The Milan exposition, which is shortly to be opened, is built on two separate pieces of ground, but facilities for getting from one part to the other are provided by a double-track, single-phase railway built on a wooden structure at a height of about 16½ ft. from the ground, and nearly 1 mile in length. The gradient is 0.9 per cent practically all the way, but at one end the track lies in a curve of a radius of some 300 ft., the gradient here attaining 3.5 per cent. Single-phase current at 2,000 volts and 15 periods per second is obtained from a motor-generator set (600 hp, 3,600-volt, 42 periods, three-phase motor and single-phase generator) in a small station at one end of the line, and is fed directly into the two overhead trolley wires which are suspended centrally over the tracks by means of wooden poles and the customary span wire construction. Trains are to be made up of four cars. The end cars are equipped with transformers for reducing the trolley voltage down to 120 volts as a minimum, and are driven by two 30-hp Finzi single-phase motors. Each of the two inner cars has only one motor. A train weighs about 56 tons when carrying its full number of passengers.—*Lond. Elec.*, April 27.

French Interurban Railway.—SOLIER.—An illustrated description of the network of electric tramways which extends without interruption over a length of about 50 km between Cagnes and Menton, passing through Nice, Monte Carlo and Cap Martin. The construction offered considerable difficulties. The 550-volt direct-current is obtained from six sub-stations which are supplied with 10,000-volt, 25-cycle, three-phase currents.—*I'Eclairage Elec.*, April 21.

Fremantle.—An illustrated article on the Fremantle municipal tramways which represent the latest electrical railway system in Australia.—*St. R'y Jour.*, May 5.

Gasoline-Electric Train.—BIELOY.—A brief illustrated description of a gasoline-electric train with which experiments have been made in Petersburg. The train consists of six cars of which the first one contains a dynamo coupled to a 35-hp gasoline engine. The dynamo can supply 142 amperes at 120 volts when running at 780 revolutions. Each car has four axles, of which two are driven each by an electric motor. The two motors on each car are connected in series. The three groups of the two motors on the first three cars are connected in parallel. The three groups of the two motors on the last three cars are also connected in parallel.—*Elek. Bahnen*, March 24.

Three-Phase Locomotives.—HERZOG.—A fully illustrated description of the three-phase locomotives for the Simplon tunnel which have already been noticed in the Digest.—*Elek. Bahnen*, March 14 and 24.

Roller Bearings.—SCHOERLING.—An account of experiments made on a motorcar of the municipal tramway system of Hanover with roller bearings of the Moffet type. The results are stated to have been satisfactory, since the saving in electric power, oil and attendance was considerable and the life of the bearings sufficiently long to make up for the comparatively high first cost.—*Elek. Bahnen*, March 3.

Instruction Book for Motormen.—BENDIX.—The conclusion of his serial on the training of motormen for electric tramways. The present installment contains a complete instruction book for hiring and training motormen.—*Elek. Bahnen*, March 3.

Failure of Brakes.—KRAMER.—A long article, illustrated by numerous diagrams, on the reasons why brakes sometimes fail on street railways.—*Elek. Bahnen*, March 14 and 24.

Electric Vehicles.—EAMES.—An illustrated article on electric trucks for city service. It can in general be stated that under some traffic conditions and surface requirements the superior mobility of the gasoline vehicle makes the saving in drivers great enough to compensate for the higher maintenance charges. Where the limitations are such, however, that the number of active vehicles required has to be about the same in each case, the electric vehicle becomes more economical on account of its lower maintenance charge. Of course, the gasoline vehicle has the advantage in all fields requiring mileage beyond that safely and conveniently obtained by the electric, but the greater proportion of city delivery service is well within the radius of travel of the electric vehicle. The expense of electric trucks is discussed with references to practical experience. In the expense of operation of electric automobiles the largest single item is the driver; the next most important item is that of maintenance, including the storage battery which should be treated as an expense account rather than an investment, as it is really slow fuel. A very considerable item in the maintenance lies in the rubber tires. Detailed cost sheets are given from experience in Pittsburg where considerable saving was obtained by the use of an electric wagon over horse traction. The author thinks that the time has come when the electric light and power companies can profitably consider the question of leasing individual charging apparatus especially suited to the proper use of their own electricity for charging private vehicles. If the electric light and power companies at present in existence do not take advantage of this active opportunity, it will certainly be done by independent capital, to their great disadvantage.—*Elec. Jour.*, May.

Motor Omnibuses.—MARKHAM.—An illustrated article on motor omnibuses for public passenger service.—*Cassier's Mag.*, May.

Installations, Systems and Appliances.

Frequency for Converters.—ROUGE.—A discussion of the best frequency to be used with rotary converters. If converters of a single-frequency are used for lighting, power purposes and traction, the best frequency is believed to be 42, since it is the highest one which permits a good conversion of current at 650 volts for traction purposes. If two frequencies are permitted, the best one for traction is 25 periods per second and the best for lighting and power purposes is 42 to 50 with machines with natural cooling and 60 to 75 with machines with artificial cooling.—*La Revue Elec.*, March 15.

Regulation of Rotary Converters.—STILL.—An article giving some notes on the regulation of rotary converters and explaining with the aid of diagrams how the pressure at the slip rings increases with increasing field ampere turns, so that it will be seen

that the rotary converter provided with a shunt winding across the brushes and a series winding carrying the load current may be made practically self-regulating at all loads, by suitably adjusting the amount of self-induction. In order to obtain this result, the ohmic resistance of the cables, transformer windings, etc., must be low.—*Lond. Elec. Rev.*, April 13.

Operation of Compound Dynamos in Parallel.—Jacobi.—When compound machines are operated in parallel it is almost general practice to employ an auxiliary connection between the machines in order to avoid the troublesome reversal of polarization of the machines. The author describes a special arrangement by which any such reverses of polarization may be effectively prevented.—*Elek. Zeit.*, April 12.

Regulation of Voltage in Transformer Stations.—Hinden.—The first part of an article, illustrated by diagrams, of various methods for this purpose.—*Elek. Zeit.*, April 28.

Electrophysics and Magnetism.

Constitution of the Electron.—Kaufmann.—The author, who formerly experimentally proved that the mass of the electron increases with its velocity, and that this mass is probably largely electrical, has been prompted by late theoretical discussions to repeat his work with a view of determining which theory best explains the experimental results. The theories he takes are those of Abraham, Lorentz and Bucherer. The theory of Abraham may be called the theory of the rigid electron, in which the field of the electron extends outwardly to infinity and within to the surface of a sphere of constant radius, a; and the Maxwellian equations relating to a solid sphere with surface or volume charge in space are employed. H. A. Lorentz assumes that the dimensions of all bodies, including the molecules and the electrons, change greatly with the velocity; and that mechanical mass changes in the same or analogous way as that of the electron. Bucherer supposes that the electron undergoes a deformation, keeping a constant volume. He makes use of the so-called "Heaviside ellipsoid," and can translate his theoretical results into those of Lorentz by this theory of deformation. Kaufmann employs in his experiments a crystal of radium bromide, submitting its beta-radiations to both electrical and magnetic fields; and carries out the research with remarkable skill. His entire apparatus can be clasped in a man's hand, and the almost microscopic details are carried to great perfection. He arrives at the result that Abraham and Bucherer's theories agree better with the experimental results than does that of Lorentz.—*Am. Jour. of Science*, May; from *Ann. d. Phys.* No. 3, 1906.

Thomson Effect.—Lecher.—An investigation of the variation of the Thomson effect with the temperature in the case of iron, copper, silver and constantan. The author used an electric furnace through which two wires of the metal to be investigated were drawn. Their ends projected from the oven and were joined across through three different thermocouples. Currents in opposite directions were sent through the two wires. The Joulean effect in the two wires compensates itself, but the two Thomson effects are added up, and their four-fold value may be obtained by reversing the current. To obtain a small gradient of potential, the wires are wound with asbestos. The Thomson effect is probably proportional to the gradient for small gradients. In iron, the Thomson effect at 52° is 27.8 x 10^{-7} gramme-calories per coulomb. The author corroborates Tait's observation that in iron the Thomson effect possesses a point of inversion. In copper the temperature coefficient of the Thomson effect is +3.01 x 10^{-7} gramme-calories per coulomb, in silver +7.36 x 10^{-7}, and in constantan −4.73 x 10^{-6}. In iron and constantan the temperature effect follows a curve of the second degree, while in copper and silver it describes a straight line.—*Lond. Elec.*, April 13; from *Wied. Ann.*, April 14.

Electrochemistry and Batteries.

Storage Batteries.—Warschauer.—A German translation in abstract of a French paper, read by Jumau before the French Physical Society. The author first discusses the lead storage battery and emphasizes the importance of diffusion of the acid into the pores of the plates. The capacity depends on the molecular condition of the active materials. The acid concentration which gives the highest capacity depends on the discharge rate. The higher the discharge rate the greater the concentration for which the capacity is a maximum. This is shown in curves, for the total cell as well as for the positive and negative plates, separately. With respect to the last two curves it is interesting to note that the concentraion for which the capacity is a maximum is smaller for the negative plates than for the positive plates with the same discharge rate. This fact is in agreement with the condition of the lowest resistance of the acid in the pores. The large influence of the temperature on the capacity is also considered as an effect of diffusion. To heat the cells in order to increase the capacity is, however, not practical on account of the deleterious effect on the negative plates with respect to local action and shortening of life. The lead-zinc accumulator and the alkaline accumulator are also briefly discussed.—*Centralblatt f. Accum.*, April 20.

Cells Acted Upon by Light.—Wilderman.—A paper on the thermo-dynamics of cells acted upon by light. When one of two electrodes is illuminated an e.m.f. is produced directly by the light on account of the increase of the chemical potential and of the solution tension of the illuminated plate, and secondly a thermo-e.m.f. is produced due to the contact of this plate with the liquid heated by the light.—*Jour. de Chimie Phys.*, February 26.

Units, Measurements and Instruments.

Measurement of Resistance.—In the Digest of April 28 we noticed an English abstract of a German paper by Jaeger in the Lond. *Elec.*, the original German paper having been published in *Zeit. f. Instrumentenkunde*, March. Jaeger now corrects several inaccuracies in the abstract in the British paper. E is not the e.m.f.; in fact, the e.m.f. does not enter into the formulæ at all. E is the expression $C_0\, e\, i\, \sqrt{A}$, where C_0 is the standard sensibility of the galvanometer (deflection for 1 ohm with 1 amp.), e the change in the resistance to be measured as fraction of the same, and i the current passing through the resistance. The sensitiveness of the measurement of resistance is proportional to E, and thus proportional to $i\, \sqrt{A}$; i. e., proportional to the electrical power which is converted in the resistance to be measured. The equations were deduced for needle as well as for moving-coil galvanometers. Further in the Thomson bridge the resistance to be measured need not be equal to the standard resistance; but it can also be measured in the ratio 1 ÷ 10, etc. The Thomson bridge is, in general, much less sensitive than the Wheatstone bridge.—Lond. *Elec.*, April 27.

Photometry.—Uppenborn.—An article in which the author first explains with the aid of diagrams the principles of the construction of photometers based upon the use of diffuse transmission and diffuse reflection. A photometer of the second type was used by the author for making photometric tests in a school room which was lighted by two special arc lamps for indirect illumination. The photometer used in this case was that of Martens, which is stated to be specially suitable for such purposes. The diffusely reflecting disc, F (Fig. 1), of gypsum is placed in the plane the illumination of which is to be measured. As comparison lamp a small benzine lamp, B, is used, the light from which is reflected by the mirror system, $s_1\, s_2$, and the small reflection prism, p, and illuminates the frosted glass, m. By adjusting the position of the mirrors, $s_1\, s_2$, the illumination of m by B is varied so that it can be measured. The two bundles of

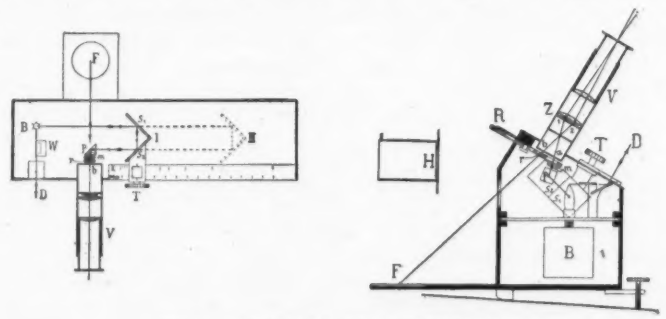


FIG. 1.—DIAGRAMS OF PHOTOMETERS.

light rays starting from F and m enter through the openings, b and a, into the tube, V, and illuminate the two halves, 2 and 1, respectively, of the twin prism, Z. The illumination of the two halves, 1 and 2, is made equal by adjusting the positions of the mirrors, s_1 s_2. A revolving disc, R, with smoked glasses of different transparencies serve for increasing the limits of measurement. The distance of the benzine lamp from the frosted glass, m, can be measured on a scale, M m. A second scale, K, is so divided that the illumination of F may be read directly.—*Elek. Zeit.*, April 12.

Determining the Hemispherical Candle-Power.—HEIMANN.—A mathematical paper on the determination of the hemispherical candle-power of a source of light which is not a single point. If the closed surface which gives out the light is uniformly illuminated over all its points, whatever its form, it sends as much light upward as downward; in this case the mean hemispherical candle-power equals the mean spherical candle-power. If the surface giving out the light is not uniformly illuminated and if its configuration and the distribution of the light over the surface are known, the mean hemispherical candle-power may be determined from the mean candle-powers of the different zones of the surface. If the surface giving out light is not uniformly illuminated, and if its form is known, but the distribution of light is not known, the mean hemispherical candle-power may be determined by measuring the spherical candle-powers of the different zones.—*Elek. Zeit.*, April 19.

Spherical Photometer.—BLOCK.—An illustrated translation of his German paper on the Ulbricht spherical photometer, which was recently abstracted in the Digest.—Lond. *Elec.*, April 13.

Lampboard.—SELIGMAN.—An illustrated description of a simple and inexpensive lampboard which enables any number of lamps being thrown in or out of circuit by simply raising a frame.—*Electrochem. and Met. Ind.*, May.

Telegraphy, Telephony and Signals.

Telephone Relay.—TROWBRIDGE.—After a critical discussion of work done by others with respect to telephone relays, he describes a type of his own invention. He intended to accomplish especially two results: First, the prevention of the reaction of the magnetic parts on the crepitation of the microphone to obviate the excessive roaring or "growling"; secondly, to provide means for a separate adjustment of the magnetic moving parts and the transmitter. The relay consists of a small coil with a laminated iron core, which is balanced by two small diaphragms in a balanced magnetic field: the telephonic currents to be repeated or relayed enter the little coil and disturb the magnetic balance in the magnetic field. In the lower diagram of Fig. 2 N S represent

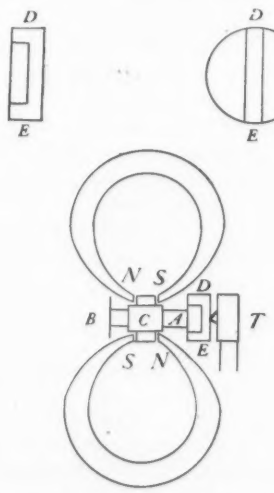


FIG. 2.—DIAGRAM OF TELEPHONE RELAY.

the poles of the magnetic field, C the moving coil actuated by the telephonic currents to be relayed, A and B the supporting diaphragms, D E sound-communicating support of the microphonic contacts or transmitter. This can be a heavy disc: in some experiments the author has used a brass disc one-half an inch thick and has relayed loud and articulate speech. The main features of this relay are these: the magnetic field acts both in the direction toward B as well as toward A. The second important principle is the freedom of the central portion of the diaphragm, A, from the pressure of the transmitter, T. The third point is the transmission of the vibrations of this diaphragm, A, by means of the sound-transmitting support of the transmitter to the transmitter, T. The air enclosed in the chamber, D E, plays a very small part in the transmission of the vibrations of the diaphragm, A. A proof of this important fact is as follows: The upper left-hand diagram represents a front view of the support, D E, of the transmitter, which in this case consisted merely of a metallic bar. The upper right-hand diagram is a side view of this case. Here the air space between the transmitter and the diaphragm, A, is not enclosed, being open on both sides of the bar, which is connected at its edges with the diaphragm, A. The transmission of speech in this case is loud, while if the connection at D and E with the diaphragm are removed and the bar upon which the transmitter rests in the same position parallel to the diaphragm, A, a very feeble sound is transmitted through the intervening air. One can, therefore, adjust the transmitter without bringing a pressure upon the most sensitive portion of the diaphragm, A, its center, and without disturbing the adjustment of the moving coil, C. The relay is very sensitive; it is loud, and the articulation good. Moreover, it is free from the objectionable growling or enhancing effect of the crepitation of the microphonic contacts on the vibrations of the magnetic portion of the relay.—*Amer. Jour. of Science*, May.

The Speaking Air-Gap of Induction Coils and Wireless Telephony.—MOSLER.—In Fig. 3, a is the armature of an alternator, b

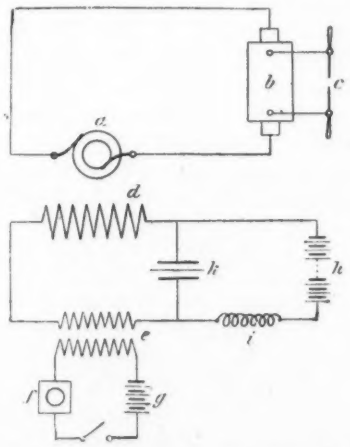


FIG. 3.—DIAGRAM OF CONNECTIONS.

an induction coil and c the air-gap; d is the excitation winding of the alternator, e a transformer and f a microphone in series with a battery, g. The intention is that the oscillating currents produced by speaking into the microphone should be transmitted into the magnetic field of the alternator, a. In order to prevent the oscillations from passing through h, an inductance, i, is con-

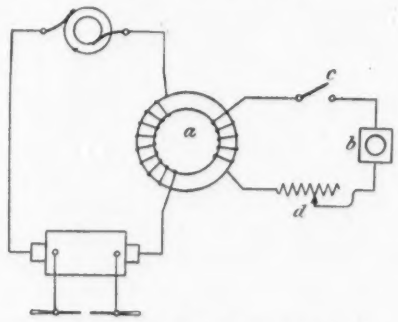


FIG. 4.—DIAGRAM OF CONNECTIONS.

nected in series with h. The intention is to force the oscillations to pass over the condenser, k, directly to the excitation winding, d, and produce thereby oscillations in the magnetic flux of the alternator, a, so that the alternating currents produced in the armature, a, are correspondingly oscillating. This arrangement is essentially the same as that used with speaking arc lamps.

Under these circumstances the air-gap at *c* reproduces all sounds spoken into the microphone, *f*, in a clear and exact way. In order to get as quiet a spark discharge as possible it is necessary to use sharply pointed electrodes. On account of the large choking effect of the field magnets the intensity of the sound is, however, considerably diminished. The author, therefore, recommends some modifications and states that the arrangement shown in Fig. 4 is especially effective, in which the secondary of the ring transformer, *a*, is directly inserted in the circuit of the alternator. If now one pole of the air-gap is earthed and the other pole is connected with a vertical wire, as in wireless telegraphy, and if the transmitting station is operated with an arc interrupter, the air-gap reproduces exactly the sound of the whistling arc with all its changes, and the same sound is reproduced in the receiving station at a distance of two kilometers, the detector being in the experiments of the author the Schloemilch (so-called electrolytic) detector. In order to base on these observations a method of wireless telephony, it would be necessary to increase the amplitude of the sound given off from the air-gap and to diminish the noise of the oscillatory sparks.—*Elek. Zeit.*, March 22.

Multiplex Telephony.—Giltay.—With reference to a former article of Ruhmer, the author discusses the possibility of multiplex telephony with the aid of Poulsen's telegraphone.—*Phys. Zeit.*, March 15.

Miscellaneous.

Mechanical Equivalent of Heat.—Rubens.—An illustrated description of a simple apparatus for determining the mechanical equivalent of heat with results of some measurements.—*Phys. Zeit.*, April 15.

Physiological Effects.—D'Arsonval.—The first part of an illustrated article on physiological effects of high-tension, high-frequency alternating currents.—*L'Electricien*, April 21.

Blast Furnace.—Richards.—In a continuation of his serial on metallurgical calculations he gives in detail the calculation of the charge of a blast furnace with a comparison of fuels, fluxes and ores.—*Electrochem. and Met. Ind.*, May.

BOOK REVIEWS.

Whittaker's Electrical Engineer's Pocket Book. Edited by Kenelm Edgecumbe, M.I.E.E., A.M.Inst., C.E. Second edition, thoroughly revised. London: Whittaker & Co. 541 pages, 161 illustrations. Price, $1.50.

The first edition of this handbook was exhausted in eighteen months, a fact that shows both its usefulness and widespread appreciation. A work of this nature is of little use unless kept up-to-date. A glance at such subjects as dynamo design, electric traction, and electrochemistry suffices to show that the editor has done his work of revision thoroughly. The modest title of "pocket-book" suggest that the work consists mainly of rules and formulæ derived from the best current practice, and as such must prove serviceable to the profession for which it was prepared.

Die Elektrischen Druckknopfsteurungen für Aufzüge. By A. Genzmer. Hannover: Gebruder Janecke. 166 pages, 180 ills. Price, 6 marks.

The apparatus employed in the starting, stopping, speed-regulation and safety insurance of electrically-operated elevators is sufficiently diversified to call for systematic description and explanation. The author as an engineer has prepared this text-book for engineering students acquainted with the elements of electrotechnics and mechanics. It deals with the various types of controllers employed in Germany in connection with electric elevators. The style is clear, the illustrations simple and abundant. Practical examples of portions of the electromagnetic mechanism are selected for discussion. In many respects the apparatus described differs from that met with in standard American practice; although much is naturally found in common to both. The book will be found useful to electrical engineering students making a special study of electric elevator apparatus.

Steam Turbines. By W. Gentsch, translated by A. R. Liddell. New York and London: Longmans Green & Co. 375 pages; illustrated. Price, $6.00.

This handsome book is a useful addition to the literature of steam and to the data on the steam turbine, and with it in his library the engineer or student will hardly need much else on the subject, just at present, though the art is advancing so rapidly no turbine book can be regarded as a permanent classic. One thing that Gentsch has done that is of value is to group the design of turbines under two designations, namely, "velocity" and "pressure," a differentiation already recognized and as clean cut as that in the hydraulic turbine field. The author has also given special attention to dynamo operation as distinguished from that of steamships, etc. A vast body of fact is incorporated into the volume, and the only fault we would find with it is that, as usual in works written on the other side of the Atlantic, the turbine invention and engineering done in America is belittled by inadequate treatment. It is time we got away from Hero to the true heroes of the steam turbine. The author by his elaborate analysis of patents has made a step in this direction.

A History of the Stevens Institute of Technology. Edited by Prof. F. DeR. Furman, M.E. Hoboken, N. J.: Stevens Institute of Technology. 641 pages; illustrated. Price, $10.

This sumptuous volume was intended as a memorial to President Henry Morton, and was in turn the outcome of an idea of his in connection with the celebration of the twenty-fifth anniversary of the Institute. In its present form it is at once a history of the famous Stevens family; a history of the Institute and a record of the achievements of the graduates. The last section, while it has a direct personal interest for many, does not possess the distinct appeal to the technical and general reading public of the other two portions.

They who would know something of the foundations of engineering in America must become acquainted with the genius and deeds of the Stevens family, than which none has made a deeper imprint on the advance of the United States in the arts and sciences. We travel so rapidly nowadays from improvement to improvement the earlier work is overlooked and forgotten, and it is well that this memorial should be available alike to the present student and the future historians. The Stevenses were great engineers, in the full sense of the epithet.

The history of the Institute is largely that of the brilliant physicist and specialist, Dr. Morton, one of the most fertile and facile of men to occupy a college presidency. It was he to whom such infinite credit is due for the success of the institution whose graduates have from the first been peculiarly leaders in the field of mechanical engineering. A degree from Stevens is equal to a seat on the Stock Exchange; it means for the possessor a competency at the start. To Dr. Morton is due the high standard of the teaching at Stevens, and the notable proficiency of each class of young men as it came forward to take up the duties of life. His place is like that of Eliot at Harvard; his stamp is deeper cut on men and things.

As to the alumni, we have in this book the records of all the 1,088 men who received degrees up to 1904. This is interesting information and is all the more valuable for its inclusiveness of good, bad and indifferent. In fact, the wonder is that so many of the men show up well in their careers; there must have been pretty severe weeding in the undergraduate years. And yet, under the present régime of President Humphreys the standard has distinctly risen, foretelling even better records in the years which are yet to come.

This volume was prepared virtually for private circulation, but it would seem that a small part of the edition has been wisely placed on sale. It is a useful addition to any engineering library and especially to collections accessible to the public.

The Electrical Installation of the Providence Lithograph Company.

One of the most interesting electrical installations in Rhode Island is the power and lighting equipment of the Providence Lithograph Company, located on Prairie Avenue, at the corner of Reynolds Avenue. All the machinery is electrically driven, in most cases direct-connected motors being used. Power is supplied by the Narragansett Electric Light Company, of Providence. In every particular the installation bears the mark of careful designing and excellent construction. In its adherence to the direct rather than the group drive, the plant is a typical instance of the latest practice.

The building is a one-story brick structure consisting of a workshop section, 300 ft. wide by 100 ft. long and an office 100 ft. square. In order to provide a solid foundation for the heavy machinery, the floor in the press and cutting rooms was built of ⅞-in. maple planks laid on 3 in. of hemlock, the latter resting on 6 in. of concrete. No vibration is apparent when the machines are in operation. Beneath the floor of the work room on the Reynolds Avenue side of the building is a fire and moisture-proof vault for the storage of lithograph stones and plates. This vault is divided into sections, each section being lighted by two 16-cp, 250-volt lamps, so that any plate or stone can be quickly found in its numbered compartment. The temperature of the vault is kept at about 70° F. by steam heat, it being essential for the

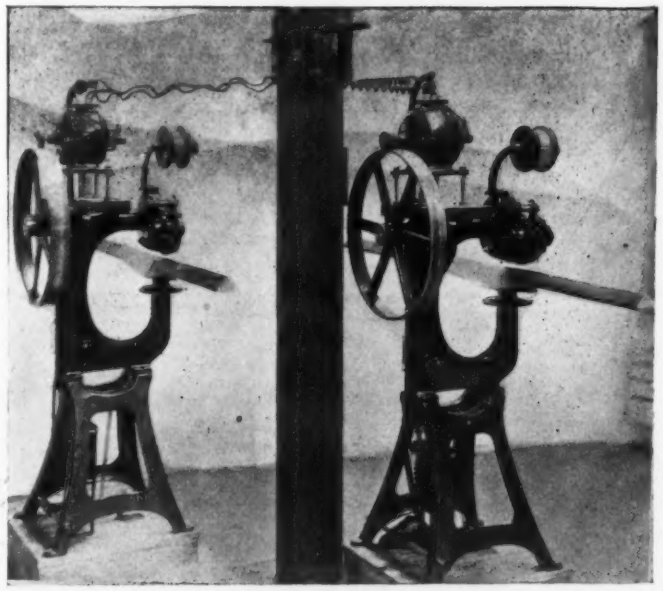


FIG. 1.—WIRE STITCHING MACHINES.

proper storage of the stones that no moisture be allowed to gather upon their surfaces. The building is lighted by 250-volt incandescent lamps, supplemented by enclosed arc lamps for general illumination. The current supply for the lighting circuits is single-phase. The lamp and switch fittings in the vault are of the marine type. The switches are operated by pendant cords of non-conducting material, so that there is no danger of shock in case an outside line becomes crossed. About 200 16-cp incandescent lamps are in service. The quality of work in the plant renders good lighting of the first importance; the larger part of the company's output consisting of colored illustrations for religious and secular educational work. Abundant natural light is, therefore, provided by saw-tooth skylights admitting north light and numerous large windows. In addition the interior walls are painted white.

All the motors are of the direct-current type, and operate at a potential of 500 volts. Motors rated at ½ hp or less are of Holtzer-Cabot type "E" design; larger motors are of type "SE," design, characterized by extreme shortness along the shaft axis, and in the compound-wound form, by a large starting torque. The result is a very narrow motor, which in many cases can be set inside the floor area occupied by the driven machine and installed so that no part of the motor projects into the aisle space. The compactness of this motor can be seen in the accompanying illustrations of lithographic presses and cutters, comparing the size of the motor with the driven machine. The motor wiring is carried in iron conduit. Special care was taken to avoid introducing shadows caused by installing wires between the machines and the skylights.

The service wires are brought in on the Reynolds Avenue side

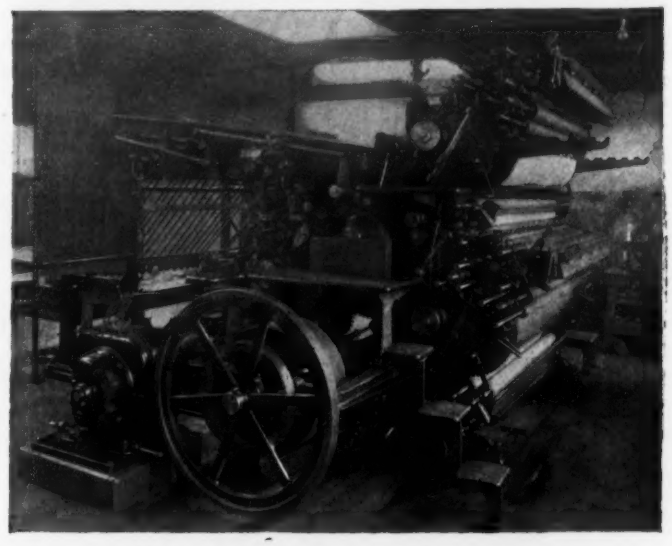


FIG. 2.—MOTOR-DRIVEN LITHOGRAPH PRESS.

of the building. The entering cables are carried in iron conduit through and down the wall to the floor and thence to two switchboard panels set up in one corner of the cutting room. The motor service is of No. 2 wire and the lighting service of No. 4 wire. The service boards are of slate, separately mounted. One is given up to motor service and is 32 in. high, 30 in. wide and 1½ in. thick. The lighting panel is of the same dimensions. The panels are mounted 12 in. apart, with a clearance of 24 in. between the panels and the nearest parallel wall. Terminal connections were specified for a minimum capacity of 100 amp. per

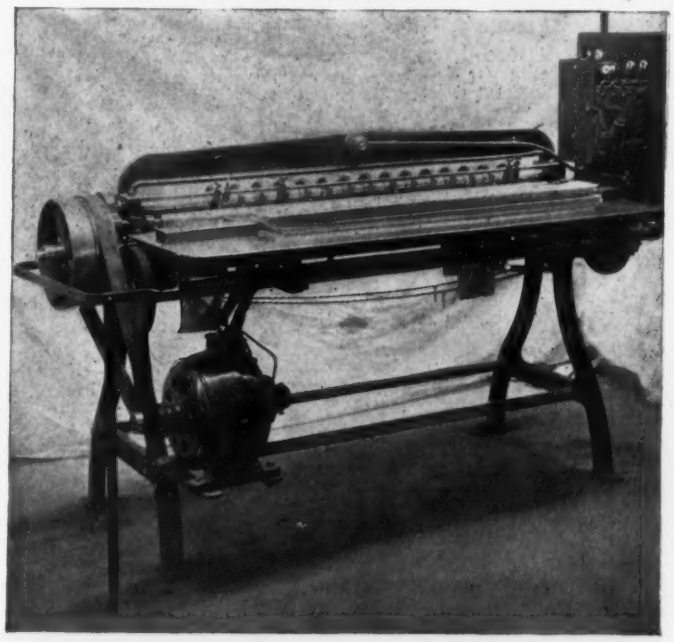


FIG. 3.—MOTOR-DRIVEN COLLATOR.

sq. in. Each panel is equipped with ammeters, a recording watt-hour meter and the usual knife switches and enclosed fuses. All mains larger than No. 7 wire are held taut by strain insulators on runs of 50 ft. or more, straightaway. Motor-starters and controllers are placed within easy reach of each operator. On the presses the controller resistance is detached, and push buttons are provided, one at the head end and one at the opposite side

of each press, for stopping the presses quickly. Motors placed on the floor are set over zinc pans.

There are about 30 motor-driven machines in the plant, which is divided into a pressroom and a cutting room section, with sub-departments in addition. In the pressroom are seven direct-driven lithograph presses. One is a tri-color press, giving 1,200 impressions per hour. This is direct-driven by a 5-hp motor. The speed of the motor ranges from 700 to 1,000 r.p.m., and the full load current is 8 amp. The motor is capable of 100 per cent overload temporarily, in starting and "inching" with the brushes fixed. All the press controllers are arranged to give two reverse speeds and are fitted with four armature resistance

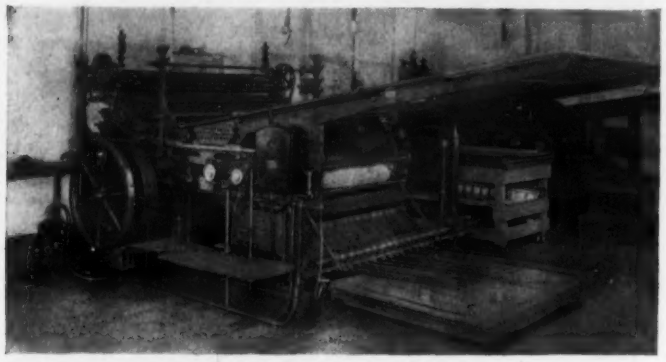


FIG. 4.—MOTOR-DRIVEN LITHOGRAPH PRESS.

points for use in forward starting and ten field points for running at different speeds. A novel feature of the control is the use of a variable resistance in parallel with the series winding for speed regulation, in place of the usual variable resistance in the shunt field circuit. No external armature resistance is used in regulating the speed, but the entire control is effected by the variable shunt around the series coil. In driving presses constant speed for any given class of work is important and the arrangement of altering a resistance in parallel with the series turns was introduced by Mr. Kelley's specifications as a better means of obtaining uniform control than the older plan of weakening the shunt field. It is undesirable to apply a motor having the characteristics of a series-wound machine to a press, on account of the variation of speed with load, and the plan of shunting the series coil makes the motor act more and more like a pure shunt motor as the shunt is made of less and less resistance. Each starting box is equipped with a no-voltage release and has sufficient resistance to start the motor from rest at full load without exceeding 1.75 times full load current. All the controllers are designed so that the attendant cannot get a shock in handling them from any point about the presses. A recent test of the motor driving the tri-color press showed a current consumption of 5 amp. on the first running point, the speed being 625 r.p.m. On the last running point the motor was making 900 r.p.m., the current being 7 amp. A two-color press is direct-driven by a 3.5-hp motor, having a speed range of from 700 to 1,200 r.p.m. This press will easily make from 1,000 to 1,600 impressions per hour maximum. The motor has a full load current of 6.25 amp. and an overload output of 7 hp. In a test of the power consumption of this press the motor took 4.1 amp., the press making 720 impressions per hour and the motor speed being 625 r.p.m. On the first speed point of the controller (second running point) the motor took 4.4 amp., the press making 900 impressions per hour, and on the second speed point the motor consumed 4.5 amp., 1,000 impressions being run off the press.

Five single-color presses are each driven by a 2.5-hp motor, the full load current of which is 4.54 amp. These presses have a maximum capacity of 1,800 impressions per hour. In a test on one of these presses the motor consumed 3.4 amp. on the first running point, 1,260 impressions per hour; 3.7 amp., fifth running point, 1,440 impressions, and 4.4 amp., eighth point, 1,620 impressions.

On the five single-color presses mentioned, the motor overload output is 5.5 hp. An interesting feature of the press equipment is the arrangement of a tell-tale signal on the wall behind each press to show when a press is over or under-speeded. In each controller is a contact which the foreman sets at the proper speed for each job, and if the operator changes the speed two lamps on the wall are lighted, showing the foreman that something is wrong. The device is of considerable importance in keeping the production of each machine at a maximum. Each controller is fitted with an overload release and each motor with a dynamic brake, which short-circuits the armature when current is cut off from the motor, bringing it to an immediate stop.

The plant contains one 42-in. by 64-in. bronzing and one dusting machine, both of which are driven through belt and line shafting by a 3-hp motor running at a speed of 1,025 r.p.m. There is also a small washing machine in this equipment.

The cutting room contains a large assortment of machinery. There are two 60-in. paper cutters, each of which is direct-driven by a compound-wound, 3.5-hp motor, whose speed is 1,200 r.p.m.

Two 50-in. paper cutters are also in service, each direct-driven by a 2-hp compound motor, with 3.6 amp. full load current and 1,200 r.p.m. motor speed. In a test on one of these cutters 2.4 amp. were required to cut stock 36 in. wide and 1¾ in. thick, and 3 amp. for 36-in. by 2⅞-in. stock. Running free with shaft and fly-wheel the cutter required 1.4 amp. In this department are also one tube machine with a 36-in. roll, driven by a ⅙-hp motor; an embossing press driven by a 1½-hp motor of 725 r.p.m. normal speed; three wire stitchers, each driven by a ⅙-hp, 1,200-r.p.m. motor, one folding machine driven by a ½-hp motor; a circular saw driven by a 3½-hp, 1,150-r.p.m. motor; two cutting-out presses, each driven by a 1-hp, 600-r.p.m. motor; three collators, each direct-driven by a ⅙-hp, 400-r.p.m. motor, and a large collator, driven by a ½-hp, 600-r.p.m. motor at a speed of 3 r.p.m. The last machine is extremely useful in enabling the different lithographs in a series to be placed in order for binding. A vertically-revolving wheel contains fourteen carriages, twelve for illustrations and binding. On each carriage is a pile of similar lithographs, and as the wheel revolves an operator picks one sheet off each carriage in the order of rotation, so that at every complete revolution of the wheel a complete set is collated. The three collating machine motors are each built in a ½-hp frame and wound for ⅙ hp to give the slow speed required, 400

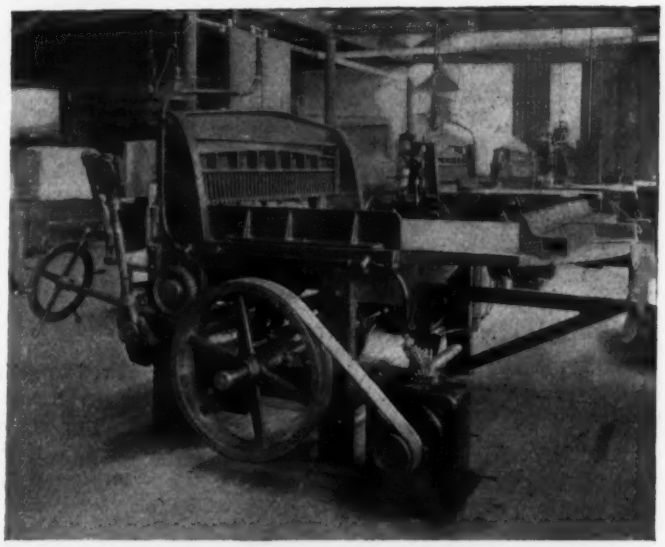


FIG. 5.—MOTOR-DRIVEN PAPER CUTTER.

r.p.m. These and the wire stitcher motors are shunt-wound machines. There is also in this room a knife-grinder driven direct by a 3.5-hp motor making 1,200 r.p.m. The plant has in addition three graining machines and a stone planer group driven by a 3.5-hp motor, and a lithographic hand press driven by a 1-hp motor. In one section of the workshop is a stock room, in which is an ink mill driven by a 7.5-hp motor. The mill is used in grinding inks and is a notable time saver.

In one portion of the shop a room for photographic work is being fitted up, and to enable pictures to be taken on dark days or at night two 30-volt, 25-amp. automatic photo-engraving arc lamps built by C. J. Bogue, of New York City, are installed.

The entire plant is equipped with automatic sprinklers of the Grinnell type.

In the design of a motor-driven plant it is often difficult to estimate correctly the time a machine is in actual operation. The owner often believes his machinery to be in service a much longer time than is the case. As a matter of fact, it is frequently found that a machine to be used in a specialized industry is not in use more than 25 per cent of the year. In this particular case the estimates of the designing engineer were based on partial power tests, and the statements of the lithograph company as to the time it thought the various machines would be in operation. These data as modified by the judgment of the designing engineer resulted in a tolerably close estimate of the use of current. The great advantage of the direct drive in using power only when the driven machine is at work is plain from his figures of estimated hours' use per month for the following machines:

	Machine estimated hours per month.	Per cent of working time 212 hours (approximate) 1 month.
Ink mill	100	47
Bronzing machine	75	35
Cutting out machine	80	38
Knife grinder	50	24
Embossing machine	80	38
Circular saw	100	47
Graining machine	150	71
Collating machine	200	94
Mailing tube machine	150	71
Stitching machine	150	71
Transfer presses	50	24
Oswego cutter	75	35
Rotary press	105	49
Lithographing press	116	55
Combination press	86	41
Two-color press	150	71
Three-color press	120	57

The estimated maximum energy consumption in kw-hours for the first month's operation was 3,566, and the minimum, 2,559. The actual figures resulting were 2,680 kw-hours.

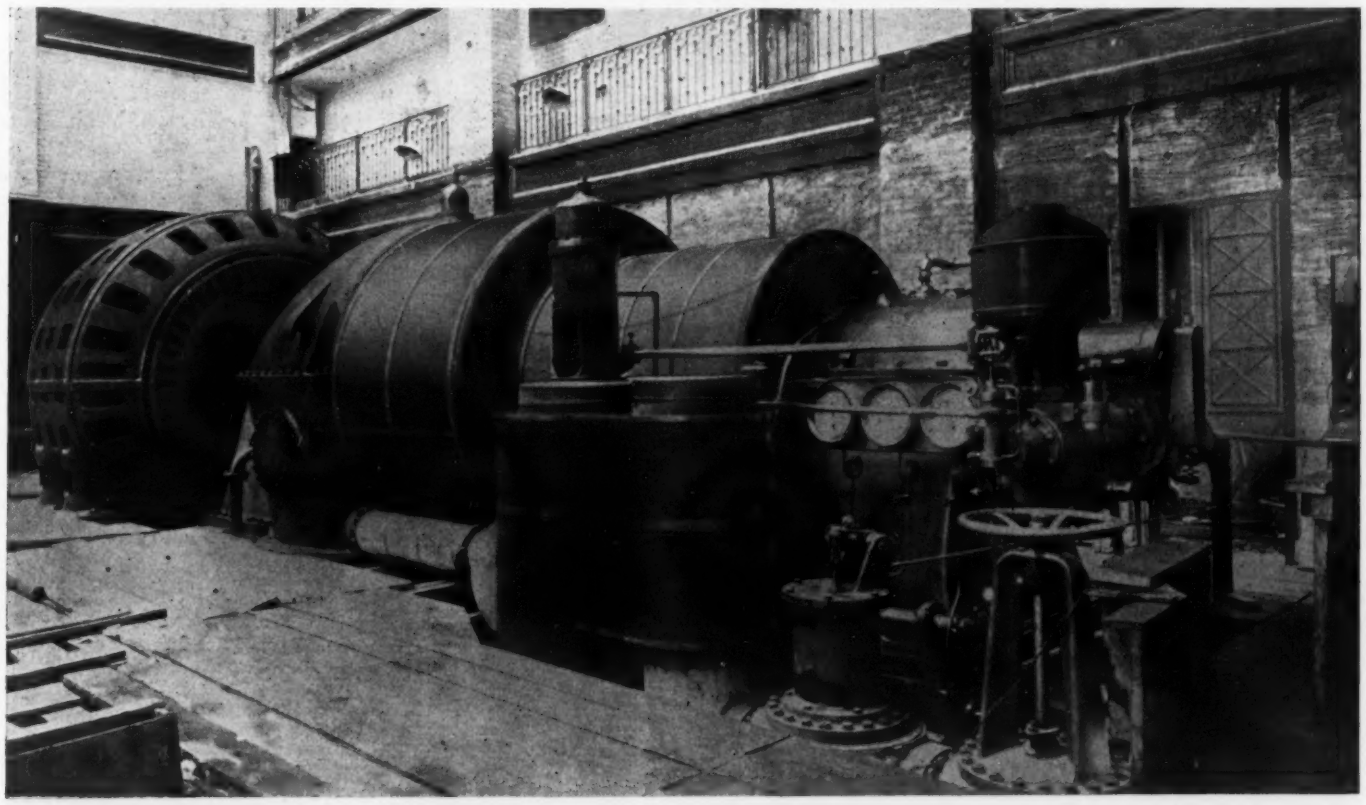
The plant is owned and operated by Messrs. Harris, Jones & Co., of Providence. The liability insurance inspector pronounced it "the best arranged, most complete and satisfactory" from a liability standpoint of any that he had examined. The architects for the building were Messrs. Lockwood, Greene & Co., of Boston, and the installing electrical contractors were Lindsley & Allen, Inc., of Providence. All the motors were supplied by the Holtzer-Cabot Electric Company, of Boston (Brookline Station), and the controllers by the Cutler-Hammer Company, of Milwaukee. The lighting equipment was furnished by the General Electric Company through the Narragansett Electric Light Company, and the designing engineer for the installation was Mr. Walter Stuart Kelley, now chief engineer of the Holtzer-Cabot Electric Company. Mr. J. H. Smith is the superintendent of the plant.

5,500-Kw. Allis-Chalmers Turbine Unit.

In our issue of November 11, 1905, a preliminary description was given of the 5,500-kw steam turbine unit building for the new Williamsburg power house of the Brooklyn Rapid Transit Company, and in the issue of December 16, 1905 appeared a description in detail of the unit, which was then in process of erection in the power house. The accompanying illustration shows this unit as now finally installed.

The machine was ready for operation on February 1, but had to await the completion of boilers, condensing apparatus, etc., which were not ready for operation until late in March. On March 27, while the machine was being prepared for test, a mishap at another power house left the railway company short of power, and after a brief test run the new machine was connected in circuit and immediately took a load of about 3,000 kw, which was all the company needed at that time. Later the load was increased to 4,000 kw, and on the following day was run up to over 5,000 kw, and on the succeeding day the load reached 7,000 kw. On March 30 the disabled apparatus having been repaired, the machine was taken out of the circuit, and a careful examination made of the interior part.

In view of the fact that in the past numerous cases were on record of steam turbine cylinders, arching slightly from



5,500-KW TURBINE UNIT IN WILLIAMSBURG POWER HOUSE.

the effect of superheated steam, in the design of the present turbine the metal was so distributed as to cause nearly equal expansion of the top and bottom of the cylinder. When the turbine was opened up, however, it was found that this compensation had been slightly overdone, and the cylinder had sagged a small amount which had caused the blading to rub hard for nearly a third of the length of the turbine. In operation, however, there was no indication that the blades were rubbing and no damage whatever was caused, the only sign of

contact being a slight wearing away of the flanges of the channel shaped shroud ring which protects the tips of the blades in the Allis-Chalmers construction. A few rows of blades at the inlet end of the turbine were found also to have rubbed owing to sand and other dirt having gotten into the turbine from the steam pipe, but in this case also the shroud ring prevented all damage. The only precaution taken before starting up again to help carry the Coney Island load on April 1 was to lower the drum a few thousandths of an inch at each end, which, so far as is known, has prevented all further rubbing and the turbine has been in daily operation ever since, not having been again opened.

The builders of the turbine are congratulating themselves, not only because the method of proportioning and constructing the turbine cylinders has overcome the previously experienced difficulties from excessive distortion with superheated steam, but also because the improved blade construction has proved itself all that has been claimed for it as regards safety of operation under adverse circumstances.

The design of the generator has proved equally successful, as it has carried large overloads each day with the greatest of ease. On one day from 5 to 6 p. m. the load averaged about 6,000 kw, from 6 to 7 p. m. 6,600 kw, and between 6 and 6.30 nearly 7,700 kw, with swings up to 9,300 kw. On April 21 for one and a half hours the load averaged about 8,000 kw, following a run at rated load, and with a temperature rise of only 22° C. On another day a load averaging 7,500 kw was carried from 5.40 to 6.40 p.m., with swings up to 9,800 kw; one swing of 9,000 kw was carried for 45 seconds and one of 9,800 kw for 15 seconds, this being 78 per cent above rated load. The highest temperature rise so far met with during any run, notwithstanding heavy overloads, has been 25.5° C.

Another interesting feature in the operation of the turbine is the remarkable coolness of the bearings, which follows in part from great care in the design of a number of points which are quite essential in high speed bearings; in part from the quality of the bearing metal, which is made specially for steam turbines in the Allis-Chalmers shops, and in part from the excellent operation of the system of flooded lubrication. The rotary oil pump which lubricates all the bearings is so noiseless and inconspicuous that the casual visitor would not notice it unless it were pointed out to him. The success of this turbine is more notable from the fact that it was the first one turned out complete from the Allis-Chalmers shops. A turbine of the same system had previously been in operation for some time at Utica, but this was built in England. A number of other Allis-Chalmers turbines built in Milwaukee are now being erected and will shortly be started.

Cook Self-Welding Wire Joint.

Wire joints (or sleeves or connectors, as they are called) and their uses have long been familiar to telephone men and to wiremen in general, but a new type now being placed on the market, and known as the Cook self-welding joint, differs in its construction and application, radically from other joints. The sectional view given of this joint and of other joints will serve to clearly illustrate the difference.

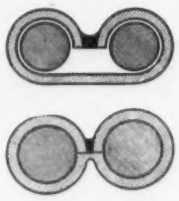


FIG. 1.—CROSS-SECTION OF JOINT BEFORE AND AFTER TWISTING.

In the old style tubular joint the tube is made to fit the wire as closely as possible. When the joint is twisted the tube is not stretched around the wire, but is drawn close to some portions of it and bulges out at other portions, thus leaving a considerable part of the surface of the wire and the joint accessible to moisture and other atmospheric influences.

The Cook joint is made with one side flat. The tube fits the wires closely, and when the joint is twisted the flat side is forcibly and naturally drawn into the recess between the wires, thus stretching the joint tightly around both wires. This makes practically a cold weld joint, and moisture or air cannot penetrate the tube and corrode the wires or the inner surface of the joint.

When the wires are inserted in the joint, twisted three times, and the joint is then cut in two, it is almost impossible to discern the line where the inside of the joint and the outside of the wire

FIG. 2.—WIRE JOINT.

come together. The tensile strength of the joint is much greater than that of the wire itself. Owing to the fact that the joint binds so tightly on the wire, it is unnecessary to turn back the ends of the wire after it has been inserted through the tube. The only instructions necessary for the use of the Cook joint are simply to insert the wires and twist three complete turns to the right. The joints are made of copper for copper wires, and of steel, heavily tinned inside and out, for galvanized-iron or steel wire. Cook's self-welding wire joints are manufactured by Frank B. Cook, 239 West Lake Street, Chicago, Ill.

Motor-Driven Hand Lathe.

The accompanying illustration shows a motor-driven spinning or hand lathe, recently brought out by the Garvin Machine Company, of New York. The head stock is fitted with a 1-hp, 110-volt motor, direct-connected with the hollow steel taper spindle, of standard size, running in gunmetal boxes. The motor is equipped with a Cutler-Hammer controller and regulator, giving a range of feeds from 800 to 2,000 r.p.m. The machine itself is the regular standard 12-in. swing lathe, made by this company. The bed is wide and deep and is closed top and bottom, except for a narrow slot, for the binder bolts, and is ribbed internally to secure the utmost rigidity and freedom from twist. The tool stand and tail stock are bound by powerful cam binders.

MOTOR-DRIVEN HAND LATHE.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.—The settlement of the anthracite coal troubles and the resumption of lake navigation have greatly improved trade conditions. Manufacturing plants operate close to their full capacity, with orders in the steel industry already running well into 1907, and structural work was never more active. Wholesale trade in fall and winter goods is on a large scale, but unseasonable weather causes much complaint regarding retail distribution of merchandise and retards work on the farms in several important sections. Railway earnings thus far available for April show a gain of 9.7 per cent over the previous year, and foreign commerce at the port of New York for the last week exhibits gains of $4,526,277 in exports and $428,538 in imports, as compared with the same week in 1905. Mercantile collections are still somewhat irregular, but show a slight improvement on the whole. Cold weather, with frosts of varying intensity, has retarded crop development, and may necessitate some replanting of cotton in the northern part of the cotton belt. The grain crops, however, have been uninjured. Exceptionally heavy orders were received in the iron and steel industry for steel rails for 1907 delivery, the Pennsylvania Railroad Company alone having awarded contracts for upward of 180,000 tons. Additional heavy business is pending. Preliminary estimates indicate a production of 3,500,000 tons in 1906, and perhaps 4,000,000 tons for 1907. Steel-making irons are scarce and active. Structural material mills are busy and a good deal of new business is in sight, but nothing has developed on account of San Francisco. Copper is firm and prices show a tendency to harden. The week was notable in the home copper market for the large demands booked from Europe. Buying for home account is continuously good under the unprecedented rate of consumption. The domestic copper market is firm at these prices: Lake, August delivery, 18⅞ to 19c.; electrolytic, August shipments, 18⅝ to 18¾c. Prime casting grades, thirty days, 18½ to 18⅝c. *Bradstreet's* reports 162 business failures during the week ending May 10, as against 139 the previous week and 158 in the corresponding week last year.

CROCKER-WHEELER ORDERS.—An order has recently been placed with the Crocker-Wheeler Company, of Ampere, N. J., for an engine type generator of 100 kw capacity to be used as exciter for a large turbo-generator. This outfit is to be installed at the Philadelphia Rapid Transit Company's power station, at Second and Grand Avenues, Philadelphia, Pa. A contract for two 500-kw generators has recently been placed by the Pittsburg & Lake Erie Dock Company, of Fairport Harbor, Ohio. The Public Service Corporation of New Jersey has recently awarded to the Crocker-Wheeler Company a contract for two 500-kw generators to be used for power purposes, at Paterson, N. J. The Elliott Laundry Company, of Baltimore, Md., has recently contracted with the company for an electrical equipment consisting of 20 motor outfits ranging from ¼ to 15 hp, for driving various laundry machinery, and one generator of 80 kw capacity for additional power. This installation also includes three motor-driven ventilating fans which will mean a great improvement to their equipment.

OIL ENGINE CONTRACTS.—The De La Vergne Machine Company, New York, reports having recently closed, among others, the following contracts for "Hornsby-Akroyd" oil engines: Windsor Locks Water Company, Windsor Locks, Conn., 50 hp for pumping station; John McKesson, Chappaqua, N. Y., 9-hp engine; Bergstrom & Bass, Brooklyn, N. Y., 20-hp; S. Oppenheimer & Co., New York, 25-hp; Freeman, Daughaday & Co., Chartley, Mass., 50-hp; township of West Lebanon, Lebanon County, Pa., 44-hp for pumping station; Borst & Rockstroh, Middleburg, N. Y., 7-hp; the John Pirkl Iron Works, Brooklyn, N. Y., 50-hp; John W. Sullivan, New York, 75-hp; Dr. F. A. C. Perrine, New York, 7-hp; Houston Ice & Brewing Company, Houston, Tex., 16-hp engine to drive a De La Vergne ice machine.

THE CANADIAN WESTINGHOUSE COMPANY, LTD., is supplying the Provincial Light, Heat & Power Company with apparatus to be used in the development of another large water power plant near Montreal. The initial installation will consist of three 3,750 kw, revolving-field, alternating-current, water wheel-driven generators of 4,000 volts, three-phase, 7,200 alternations; also twelve 2,500-kw, 44,000 volts, oil-insulated, water-cooled transformers. This new power station will be used for supplying additional power to the Montreal Light, Heat & Power Company, at Montreal. The step-up transformers will be wound for 4,000 to 44,000 volts, and the lowering from 40,000 to 12,500 volts. The transmission line is about 40 miles in length.

FACTORY AT RAVENNA, OHIO.—Mr. H. T. Johnson, of the Manhattan Electrical Supply Company, is superintending the erection of a large plant in Ravenna for the manufacture of carbons and primary batteries. The foundations for four furnaces have already been built and there will be several other large buildings in the plant. It is stated that the original plan of incorporating the Ravenna plant as a separate concern under the name of the Electrical Products Company has been deferred and that the new plant will be operated as a branch of the Manhattan Electrical Supply Company, of New York City, which now has a large factory in New Jersey.

LARGEST FACTORY BUILDING IN THE WORLD.—A Pittsburg despatch states that plans are being prepared by engineers of the American Bridge Company for the largest single factory building in the world. The plant will be constructed at McKeesport for the National Tube Works and will cost more than $2,000,000. The one building will have a floor space, on one floor, of more than 1,000,000 square feet. The building will be 1,500 feet long and more than 600 feet wide and about 45 feet high. Four 15-ton electric traveling cranes will run the entire length of the building, and electric power will be utilized on the most extensive scale.

STEAM TURBINES IN COTTON MILLS.—The Francis Cotton Mills has recently adopted Westinghouse-Parsons turbines for their power plant at Biscoe, N. C. This plant adds one more to the list of cotton mills using steam turbine power. Some of the plants in this field are those of the Pelzer (S. C.) Manufacturing Company, 1,500 kw; the Oneita Knitting Mills, Utica, N. Y., 500 kw; Henrietta (N. C.) Mills, Gray Manufacturing Company, Charlotte, N. C.; Modena Cotton Mills, Gastonia, N. C., and the Lumberton (N. C.) Cotton Mills. These plants are now in highly successful operation.

DODGE & DAY, engineers, of Philadelphia, have been commissioned by the Kerr-Murray Manufacturing Company, of Fort Wayne, Ind., manufacturers of gas works machinery and gas holders, to design, erect and equip a new plant. The present factory is much too small for the requirements of their business and the Kerr-Murray Company has secured a plot of 30 acres close to Fort Wayne. Preliminary work is about completed and construction work will be started at once.

THE AMERICAN CAN COMPANY, of New York, N. Y., purchased recently through the New York office of the Allis-Chalmers Company a 20 and 40 by 42 heavy-duty, cross-compound engine, direct-connected to a 500-kw, direct-current generator, switchboard, etc. The electrical apparatus for the new outfit will be built at the company's electrical works, Cincinnati, while the engine will be built at the West Allis, Milwaukee, shops.

APPARATUS FOR 'FRISCO.—The Westinghouse Electric & Manufacturing Company has shipped to the Pacific Coast from Pittsburg 35 carloads of electrical machinery. In a week 30 cars more will leave for San Francisco. A temporary warehouse has been erected in San Francisco. The company also has signed a lease for three floors of a new steel building to be erected at National and Second Streets.

DUTY ON X-RAY TUBES.—In a decision by Sub-Board No. 2 of the United States General Appraisers, it was decided this week that foreign X-ray tubes must be assessed on a higher basis, with a correspondingly heavy duty. The tubes were from C. H. F. Muller, of Hamburg, and were invoiced at prices unsatisfactory to the appraising officers.

Financial Intelligence.

THE WEEK IN WALL STREET.—The stock market was moderately active and substantial recoveries from the recent declines are noted. Improved financial conditions and easier money seem to have given renewed confidence to bullish operators, the rise in prices being helped by covering of the extensive short interest. Bonds show a tendency to improve on the better money market conditions. Among the tractions, New York Metropolitan Street Railway and Interborough stocks were stimulated by the favorable showing which they made with regard to earnings for the March quarter. The United States Steel stocks tended to improve on scattered buying. The industrials generally participated in the improvement, a good deal of attention being again given to specialties like International Pump. Allis-Chalmers common closed at 21⅛ and preferred at 57, these figures being net advances of ⅛ and 1⅛, respectively, and General Electric made a net gain of 1¼ points, closing at 167¾. American Locomotive common closed at 67⅛, a gain of 6⅝ points, and preferred at 114½, an advance of 2 points. The greatest activity in the tractions was in Brooklyn Rapid Transit, of which 298,700 shares were sold at prices ranging between 77½ and 84, the closing quotation being 83, which is a net advance of 5 points. Metropolitan Street Railway gained 3½ points, closing at 116, and the last quotations of Interborough-Metropolitan common and preferred were 54¼ and 86¼, these being net gains of 4¼ and 1½, respectively. American Telephone & Telegraph closed at 135½, an advance of ¼, but New York & New Jersey Telephone lost 1 point, closing at 147. Western Union Telegraph is down 1⅝, the last quotation being 92⅜. Interborough Rapid Transit, on the curb, jumped to 231 from 218½, and closed with a net gain of 12¾ points. The curb market showed general recoveries, but the volume of business was not large. Following are the quotations on the stock exchange at the close of business May 15:

NEW YORK

	May 8	May 15		May 8	May 15
Allis-Chalmers Co.	21⅛	20⅝	General Electric	168¾	167½
Allis.Chalmers Co. pfd.	57¾	56	Hudson River Tel.	...	...
American Dist. Tel.	*39	*39	Interborough Rap. Tran.	222¼	232
American Locomotive	63⅝	67¼	Mackay Cos.	63¾	72
American Locomotive pfd.	113	114	Mackay Cos pfd.	71⅛	74
American Tel. & Cable	91	90	Marconi Tel.	...	...
American Tel. & Tel.	133	138	Metropolitan St. Ry.	112¼	115
Brooklyn Rapid Transit	82⅝	83¾	N. Y. & N. J. Tel.	...	...
Electric Boat	18	18	Western Union Tel	91⅝	92¼
Electric Boat pfd	65	65	Westinghouse com.	150	153
Electric Vehicle	15¼	11	Westinghouse pfd.	...	...
Electric Vehicle pfd.	17⅛	18			

BOSTON

	May 8	May 15		May 8	May 15
American Tel. & Tel.	134½	139	Mass. Elec. Ry. pfd	64½	65
Cumberland Telephone	...	117½	Mexican Telephone	3⅞	...
Edison Elec. Illum.	247	246½	New England Telephone	138	138
General Electric	...	168¼	Western Tel. & Tel	12¼	...
Mass. Elec. Ry.	18	18⅛	Western Tel. & Tel pfd.	...	90

PHILADELPHIA

	May 8	May 15		May 8	May 15
American Railways	51⅛	51⅛	Phila. Electric	8¼	9
Elec. Co. of America	11⅞	11¼	Phila. Rapid Trans.	26¾	26⅝
Elec. Storage Battery	72⅛	73	Phila. Traction	98¾	99
Elec. Storage Battery pfd.	...	..			

CHICAGO

	May 8	May 15		May 8	May 15
Chicago City Ry.	150	150	National Carbon	89	88
Chicago Edison	145	...	National Carbon pfd.	118	120
Chicago Subway	54	...	Union Traction	...	...
Chicago Tel. Co.	115	...	Union Traction pfd	...	...
Metropolitan Elev. com.	26	27⅛			

* Asked

ELECTRIC PROPERTIES COMPANY.—One of the most important steps taken of late years in the domain of electrical finance and engineering is the formation of the Electric Properties Company, in regard to which rumor has been busy the past few months. It is in itself an indication of the growing magnitude of electrical operations, and is a further evolution of the process that has already created kindred institutions of prominence for the handling of electrical enterprises in the public service field. The new corporation will have a capital stock of $6,000,000 preferred and $6,000,000 common, and may also issue collateral trust bonds secured by a pledge of securities acquired in the course of the financing and development of plants of the character indicated. An important part of the initial programme has been the acquisition of the entire stock of Westinghouse, Church, Kerr & Co., whose engineering operations on a gigantic scale have been one of the features of modern light, power and traction, while inclusive also of work in railway terminal, factory and hotel construction. This work will all be continued without change, but with a larger area of contact and opportunity under Mr. Walter C. Kerr, a president whose brilliant administrative and executive qualities have equaled his sound engineering judgment. As a matter of fact, no changes will occur in this underlying organization. The Electric Properties Company itself will afford a felicitous illustration of the newer close relations in finance and engineering, in having as its president Mr. John F. Wallace, the distinguished civil engineer, of Illinois Central and Panama Canal fame. He will give its affairs his whole time and attention, and several large and important negotiations await immediate action. The company while thus rich in engineering talent of the first order will employ other engineering companies or individuals as occasion may arise. The directorate comprises the following: Charles H. Allen, vice-president Morton Trust Company; Paul D. Cravath, of Cravath, Henderson & De Gersdoff; H. D. Giddings; N. W. Halsey, of N. W. Halsey & Co.; George C. Smith, vice-president Security Investment Company; John A. Spoor, president Union Stock Yards & Transit Company, and president Chicago Junction Railway Company; Moses Taylor, Kean, Van Cortlandt & Co.; E. G. Tillotson, vice-president Cleveland Trust Company; F. D. Underwood, president Erie Railroad; R. B. Van Cortlandt, Kean, Van Cortlandt & Co.; John F. Wallace, president Electric Properties Company; George Westinghouse. It will be seen that while in a sense of Westinghouse origin and likely to be regarded by some as one more in the long list of concerns bearing the Westinghouse imprint, the new company is in reality an "open corporation," ready and prepared to deal with propositions of a desirable nature throughout the whole range of electrical engineering development.

INTERNATIONAL STEAM PUMP.—The new issue of stock of the International Steam Pump Company authorized last week will not be offered for subscription. The entire amount, consisting of 25,000 shares of preferred stock and 55,000 shares of common stock, will be taken by the Power & Mining Machinery Company in payment for its capital stock. The authorized and outstanding common stock of the Power & Machinery Company amounts to $1,500,000 and its preferred stock to $1,000,000. The company has been in existence since April, 1903. As a condition of the sale of its stock to the Steam Pump Company it is guaranteed that its net profits for the next five years will aggregate at least $1,150,000. This would be equal to 1,437 per cent on the Steam Pump Company's new stock issue of $8,000,000 for the entire five years, or at the rate of .287 per cent per annum. The issue of common stock is not taken into consideration, however, inasmuch as the Steam Pump Company does not pay dividends on its common. This would leave but $2,500,000, instead of $8,000,000, on which dividends would have to be paid. By the terms of the purchase the International Steam Pump Company also comes into possession of liquid assets of the Power & Mining Machinery Company to the amount of $2,750,000, independent of the plant. A portion of this amount, estimated at $1,100,000, can be used for working capital by the Steam Pump Company in its individual business.

DIVIDENDS.—The Northern California Power Company has just paid in San Francisco its twenty-sixth regular monthly dividend, despite earthquake and fire. The Rochester Railway & Light Company has reclared a regular quarterly dividend of 1 per cent, payable June 1. The directors of the American Railways Company have declared a regular quarterly dividend of 1½ per cent (75 cents per share), payable June 15. The regular quarterly dividend of the American Telegraph & Cable Company of 1¼ per cent is payable June 1. The Columbus Street Railway Company has declared a regular quarterly dividend of 1¼ per cent on the common stock, payable June 1.

TELEPHONE STOCK INCREASED.—At a special meeting of the stockholders of the New England Telephone and Telegraph Company last week it was voted to increase the capital stock from $30,000,000 to $50,000,000 for general purposes of the company. The regular annual meeting was held after the special meeting and retiring directors were re-elected. Francis H. Dewey was chosen in place of Stephen Salisbury, deceased. In the annual report Thomas Sherwin, the president, said that the growth of the business during the last year had been unprecedented. The entire number of exchanges and toll stations connected with the system is 203,821.

MANILA RAILWAY AND LIGHTING.—The operating department of J. G. White & Company reports the earnings of the Manila Electric Railroad & Lighting Corporation, for the month of April, by cable from Manila, as follows: Railway department, gross receipts, $46,750; net receipts, $24,750; light and power department, gross receipts, $28,000; net receipts, $13,900. The earnings of the railway department of the corporation for the week ending May 7 are $11,750, as reported by cable.

MICHIGAN STATE TELEPHONE REPORT.—The annual report of the Michigan State Telephone Company for the year ended December 31, 1905, shows gross earnings of $2,293,552, net earnings of $673,328, dividend payments of $137,100, and a net surplus of $322,752.

GENERAL NEWS.

Construction News.

PRESCOTT, ARIZ.—Two large power plants are being constructed near this city. One, which is known as the Arizona Power Company, will have a capacity of 6,000 hp and will transmit power to the mines at a voltage of 33,000. The other, the Prescott Power Company, will furnish 10,000 hp at about 22,000 volts.

YELLVILLE, ARK.—The City Council has granted a franchise to C. L. Morgan, of Detroit, Mich., to build an electric railway in the town.

RIVERSIDE, CAL.—J. D. Maxfield has the contract for installing the electric light plant at the Arlington mine in Arlington.

LOS ANGELES, CAL.—The Home Telephone Company will build a long-distance line between Los Angeles and San Francisco.

PASADENA, CAL.—Heman Dyer, City Clerk, writes that the citizens have voted to issue $125,000 to acquire an electric light plant

ANAHEIM, CAL.—Engineer A. L. Lewis, of Anaheim, writes that the city will probably call for bids in about 3 months for the proposed electric light plant to cost $25,000.

FRESNO, CAL.—J. C. Drake, Edison Building, Los Angeles, writes that his company proposes constructing four power plants on Kings River, Fresno County, to cost in all about $8,000,000 Location surveys are now being made. F. C. Finkle, chief engineer, Edison Building, Los Angeles.

UKIAH, CAL.—Bids will be received until June 6 by the board of supervisors of Mendocino County, Cal., for a franchise for erecting and maintaining a line for the transmission of electric power, and for telegraph and telephone lines in the county of Mendocino. M. L. Gibson is chairman.

SAN FRANCISCO, CAL.—It is stated that the Valley Counties Power Company proposes to proceed at once with the development work which was planned and being prosecuted previous to the great disaster to San Francisco. The work of putting in a new pipe line, the widening of the ditch and the installing of another unit in the Centerville power house on Butte Creek, above Chico, will be resumed at once.

LOS ANGELES, CAL.—Work has commenced on the extension of the Vineland power station of the Los Angeles-Pacific Railway. Machinery will be installed immediately to double the capacity of the plant, which is to be finished in time for the summer season, when additional two units will be installed, to be finished within a year. The cost is estimated at nearly $1,000,000. The company also has other large extensions under way.

BOULDER, COL.—The plant of the Boulder Light & Power Company has been purchased by the Northern Colorado Power Company for $25,000. The new company is making arrangements to take over the electric plants at LaFayette, Col., and Cheyenne, Wyo.

ASPEN, COL.—D. R. C. Brown, president of the Roaring Fork Electric Light & Power Company, of Aspen, is interested in the construction of a new light and power plant a few miles below Aspen. It is proposed to harness the waters of Castle Creek and Roaring Fork and generate electricity to light the villages between Aspen and Carbondale.

THOMPSONVILLE, CONN.—It is reported that the Enfield Electric Light & Power Company will change ownership before June 1.

BRIDGEPORT, CONN.—An electric light plant will be installed in the Lincoln Building which is being constructed on Cannon Street for Thomas P. Taylor.

NEW HAVEN, CONN—A 150-hp generator will be installed in the new plant of the F. P. Pfleghar & Company, which is now being constructed, to operate the machinery by electricity. The entire plant will cost about $100,000.

EAST HAMPTON, CONN.—Civil Engineers Raisom & Hoadley, of Providence, R. I., who are in the employ of the Salmon River Power Company, are preparing plans to bring about the completion of one of the best water privileges in the State. The company proposes to erect three dams, the rights of way having been secured along Salmon River and above in Marlborough, where a large reservoir will be built. At Comstock Bridge, a few miles further south, another dam will be built, just above the present dam of Brown Bros. Paper Company. At Leesville, four miles below, the big dam is to be constructed and the power house located there. This dam is to be built just above the present dam, which supplies power for the East Haddam Electric Light Company. It will extend from rock ledge to rock ledge, 550 feet, with a spillway of 160 feet. This will give a working head of 73 feet and develop 1,500 horse-power. The Rhode Island Contract Engineering Company has the contract for the work. As soon as they are running the East Haddam Electric Light Company, which supplies lights in the towns of East Haddam and Chatham, will be improved and extended.

WASHINGTON, D. C.—Bids will be received until June 2 by Mordecai G. Endicott, chief Bureau Yards and Docks, Navy Department, Washington, D. C., for furnishing 2 motor generator sets at the navy yard, New York, as per specification No. 1,495; estimated cost, $12,000.

WASHINGTON, D. C.—Bids will be received until May 29 at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., to furnish at the Navy Yard at Pensacola, Fla., and the Naval Station at Key West, Fla., and New Orleans, La., naval supplies as follows: Schedule 545—Electrical conductor and supplies, tube expanders, brass, etc.; also same time and place to furnish at the works of the New York Shipbuilding Company, Camden, N. J., and the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., electrical equipments. Applications for proposals should refer to Schedule 544. H. T. B. Harris, Paymaster-General, U. S. N.

DAVISBORO, GA.—J. T. Orr is planning to erect an electric light plant and will probably organize a stock company.

WAYNESBORO, GA.—It is reported that bonds to the amount of $60,000 have been issued for the construction of water works, a sewerage system and an electric light plant. F. L. Scales is mayor.

COMMERCE, GA.—The board of directors of the Harmony Grove Cotton Mills, Commerce, will take figures on May 18 for machinery and material for an electric light plant. Plans and specifications can be had by addressing Joseph M. Roman & Company, Engineers, of Atlanta.

MERIDIAN, IDAHO.—The Town Council has granted Seymour H. Bell, of Ontario, Ore., a franchise for the installation of an electric light plant.

KOKOMO, IND.—The Citizens' Telephone Company is making arrangements to increase the capacity of its plant; the switchboard will also be enlarged.

VINCENNES, IND.—The Vicennes Street Railway Company has been merged with the Vincennes Traction & Light Company. The capital of the company is $600,000. B. G. Hudnut, of Terre Haute, is president.

HARTFORD CITY, IND.—The Wayne Paper Company, of this city, contemplates making some inprovements in its plant. The company is asking the City for a franchise to furnish a day system of electric lighting and power.

INDIANAPOLIS, IND.—At a recent meeting of the officers of the Indianapolis, New Castle & Toledo Railway Company it was decided to commence the construction of the power house at New Castle as soon as possible. The Electrical Installation Company and the Allis-Chalmers Company will build and equip the road.

INDIANAPOLIS, IND.—The Laycock Powerhouse Company has begun work on its power plant in this city. The building will be five stories high and occupy an entire block. The purpose of the company is to furnish space and power to a large number of small manufacturers. The company is now in the market for electrical equipment and power apparatus of all kinds to be installed in its plant.

KOKOMO, IND.—One of the first acts of the new City Council is a movement toward the construction, of a municipal light plant. Although the contract with the Kokomo, Marion & Western Traction Company to light the city has three years to run, General Manager McReynolds informed the Council that the city would be released from the contract as soon as a local plant was built and ready for operation.

RICHMOND, IND.—The experts who have been investigating and examining the municipal lighting plant have submitted a report to the Mayor, which, in substance, shows the municipal plant to be in good condition and that it has proved a success; that in addition to saving money in street lighting it has made an actual profit from commercial lighting during the last three years. This report has changed public sentiment greatly and the referendum vote is likely to result in favor of retaining the plant.

TAHLEQUAH, I. T.—The Pioneer Telephone Company has purchased the telephone line between Tahlequah and Muskogee and east to Fayetteville and is rebuilding the line.

RYAN, I. T.—The Red River Traction & Power Company is preparing to make the preliminary survey for an electric railway from Ryan to Marietta. It is the intention of the company to extend the survey as soon as possible from Lawson to Denison.

SCHLESWIG, IA.—It is stated that this city will construct a lighting plant.

FORT DODGE, IA.—The contract for the power plant to be used by the Newton & Northwestern road has been let to the White Electric Company of New York City. The plant, which is to be located at Frazier, will cost about $150,000.

OSKALOOSA, IA.—The officials of the Oskaloosa & Buxton Interurban Railway Company have made all arrangements for taking over the property of the Oskaloosa Light & Traction Company, which operates the street railway and lighting system in this city, on which options were secured sometime ago, and the increasing of its capital stock from $500,000 to $750,000, providing the plans are endorsed at the meeting of the stockholders to be held about May 20. Plans are also completed for the commencement of the construction of its line from Oskaloosa to Buxton.

CALDWELL, KAN.—The City Clerk writes that it is proposed to construct an electric light plant, at a cost of $15,000. E. E. Rogers is engineer.

TOPEKA, KAN.—The Independent Telephone Company has purchased a site on Jackson Street, on which it will erect a telephone exchange and office building, which will cost about $25,000

OBERLIN, KAN.—The citizens of Oberlin have voted to appropriate $10,000 to build an electric light plant. E. E. Rogers, of Wamego, Kan., is consulting engineer, and has charge of the construction of the plant.

VINTON, KAN.—The Vinton & Cameron Mutual Telephone Association has been organized for the purpose of building a rural telephone line from Vinton by the way of Cameron to Arkansas City. The officers are G. W. Williams, president; Austin Gilstrap, secretary, and E. T. Payne, treasurer.

SHREVEPORT, LA.—The Shreveport Gas, Electric Light & Power Company has recently purchased a 26x36-in. Reliance engine as an additional power unit, from the Allis-Chalmers Company, of Milwaukee, Wis.

FT. WILLIAMS, ME.—Bids will be received until June 15 by Mayor A. W. Yates, Quartermaster U. S. A., Portland, Me., for furnishing and installing of electric light fixtures in the band barracks, Ft. Williams, Me.

HAMILTON, MD.—A contract has been awarded to White & Middleton for the machinery for the water works and electric light plant.

FT. WASHINGTON, MD.—Bids will be received until June 11 by the Constructing Quartermaster, U. S. A., Ft. Hunt, Va., for furnishing and installing electric light fixtures and wattmeters in the post exchange and gymnasium building at Ft. Washington.

PITTSFIELD, MASS.—The Musgrove Knitting Mill is now using electric power in place of steam, for operating its machinery.

TEMPLETON, MASS.—A special town meeting has been called to consider the question of establishing a municipal electric lighting plant in this town.

FALL RIVER, MASS.—Work will commence June 1 on the new electric plant for the Fall River Electric Light Company. The plant complete will cost about $200,000.

ATTLEBORO, MASS.—The railroad company will install a power plant in connection with the new station to supply heat and light for the buildings of the railroad, and also for the platforms, yards and ways.

LOWELL, MASS.—The Electric Light Company has recently received some of the new metallized filament lamps which it has offered to furnish the city at $22.50 per lamp per year for all-night and every-night lighting. Ten of these lamps have been installed on Andover Street.

WRENTHAM, MASS.—At a recent meeting of the committee on electric lights and water, a sub-commitee was appointed to look into the advisability of lighting the town by electricity. The members of the subcommittee are Artemas Willard, E. Payson Bennett and Hiram A. Cowell.

CHESTER, MASS.—Owing to the refusal of the Chester Electric Light Company to furnish additional lights for Prospect Hill, the prudential committee of the fire district has notified the company that it will not be required to do any street lighting after May 1. For the present the town will be without electric lights in the streets.

CAMBRIDGE, MASS.—The new baking plant of the Ward-Corby Company, of this city, is equipped with electrical power. The power plant consists of two Heine safety boilers of 244 hp each and two Harrisburg engines direct connected to generators. Every machine in the building has its individual motor. There is also installed a 30-ton York ice machine.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company has petitioned the city for the privilege to put conduits in Kempton Street. The company is contemplating a general change in its electric light service at the north end of the city, and it is proposed to double the voltage, for that reason the company wants to put the wires underground. George R. Stetson is president.

GREENFIELD, MASS.—The Greenfield Electric Light & Power Company is arranging to have its commercial ligthing system run independently of the street railway power. The company has ordered a motor generator set for exciting the generators, and proposes to have the commercial lighting run by steam. The street lamps and the power motors will run by steam or water power, as needed.

WEST SPRINGFIELD, MASS.—A special town meeting will soon be called by the selectmen to take up the subject of electric lighting. The contract with the United Electric Light Company will expire in about seven mouths. As the town owns its poles and wires many of the citizens advocate installing a municipal plant; under the existing conditions no consideration is allowed for the use of them.

SAULT STE. MARIE, MICH.—This city has decided to appropriate $90,000 for extensions and improvements to the gas and electric light plant.

DURNAD, MICH.—The Shiawassee Light & Power Company has completed arrangements for taking on the franchises and contracts of the Morrice-Perry Electric Company.

SAGINAW, MICH.—Geo. W. Silsby, of Saginaw, is president of the Rifle River Power Company, which proposes developing Rifle River. H. von Schon, of Detroit, is engineer in charge.

HART, MICH.—A meeting will soon be held to vote on the proposition of contracting with the Pere Marquette Light & Power Company to furnish power to run the water works plant and furnish light for the village.

PONTIAC, MICH.—Probably sometime during the next two months bids will be asked for the construction of the proposed power plant for the Clinton River Power Company, of Pontiac, to cost about $125,000. H. von Schon, of Detroit, is engineer.

CLIMAX, MINN.—Brasetti Brothers are interested in the construction of an electric light plant.

MANKATO, MINN.—The Northwestern Telephone Company will expend about $15,000 in improvements to its plant in this city.

DULUTH, MINN.—Bids will be received until May 28 by the Common Council for $375,000 bonds for the purpose of extending, enlarging and improving the water and light plant. H. W. Cheadle is city clerk.

ST. PAUL, MINN.—The Northern Heating & Electric Company, successor to the American District Heating Company, which has a franchise for heating the downtown district, has applied for a lighting and power franchise. The company has erected an electric plant and wishes to combine lighting and power with its steam heating business.

MERIDIAN, MISS.—The Meridian Home Telephone Company, of Meridian, Miss., has been given a charter to do business in Alabama, with Mr. D. S. Knight as agent.

IUKA, MISS.—The North Mississippi Traction Company contemplates the erection of a dam across Bear Creek, fourteen miles south of Iuka. The dam will cost about $50,000, and will furnish at low water, not less than 4,800 horse-power. The company also plans to build an electric railway from the mouth of Indian Creek to Columbus, Miss. The incorporators are J. W. Buchanan, A. H. Longine, A. J. Hackett, Newman Cacye, T. B. Franklin, T. L. Wainwright, J. W. Jourdan, P. E. Williams, John L. Buckley, B. W. Stratton, M. T. Bynum, J. J. Coman, Edward W. Yerger, F. T. Carmack and R. C. Lee.

ST. LOUIS, MO.—A franchise has been granted to Eugene Slevin and others by the St. Louis County Court to build a railway line from the city limits at McLaren Avenue.

WEST PLAINES, MO.—The citizens of Pottersville and Crider have organized a telephone company to build a telephone line from Crider to West Plaines, by the way of Pottersville.

BUTTE, MONT.—The Council has granted a franchise to the new telephone company. Elmer B. Jones is interested.

OXFORD, NEB.—The question of issuing $20,000 light and water bonds is under consideration.

FREMONT, NEB.—The City Council has accepted the report of Engineer Chapman, of Chicago, Ill., which provides for the reconstruction of the municipal water works and electric light plant on a new site, at a cost of about $83,911. An election will probably soon be held to vote on the question of issuing bonds for the same.

NEWTON, N. J.—It is reported that an electric plant is to be built at Glenmere. Sufficient power will be developed to supply Goshen with light all the year, and to supply Chester, Warwick and Florida for six months of the year.

NEWARK, N. J.—The Public Service Corporation of New Jersey has made a proposition to the finance committee of the council to furnish light and power for all the municipal buildings, including the new City Hall, for a term of five years at a flat rate of five cents per kw-hour. The acceptance of the proposition is still in abeyance.

PLAINFIELD, N. J.—Thomas N. McCarter, president of the Public Service Corporation of New Jersey, has notified the Plainfield Protective Association, that beginning with May 1, the price for electricity in Plainfield will be 12 cents per kw-hour, with a reduction to 11 cents on January 1, 1908, and a further reduction to 10 cents in January, 1910.

SOUTH ORANGE, N. J.—The special committee appointed by the Village Improvement Society to investigate into the practicability of the municipal ownership idea, has reported against the establishment of such a plant, but Charles H. Ingersoll, representing the minority, believes the plan feasible and offers facts and figures to offset those presenting the opposite view.

ROCKVILLE CENTRE, L. I., N. Y.—Bonds to the amount of $7,000 have been sold to be used for improving the lighting system.

WEST ALBANY, N. Y.—C. F. Karl and Chris. Frischknecht have been appointed to let the contract and supervise the construction of an electric light plant for the village.

WATERFORD, N. Y.—John Flynn, Troy, on May 7 submitted to the board of trustees of Waterford, plans and estimates for a municipal water works and electric light plant; the estimated cost is $113,875.

HARTFORD, N. Y.—The village board has granted the Hudson River Electric Power Company a franchise to erect poles and string wires on the streets of the village for the purpose of furnishing light and power.

SYRACUSE, N. Y.—The Syracuse Lighting Company contemplates putting in a new arc light system with improved lamps, at a cost of $187,424. It is stated that the company proposes to equip its system with magnetite lamps.

ALBANY, N. Y.—Bids will be received until June 2 by J. G. White & Company, Inc., 43 Exchange Place, New York City, for furnishing material, erecting and putting in operation in the State capitol boiler room and connecting tunnel, three direct-connected engines and electric generators, two of 250-kw rated output and one of 100-kw., two motor-

generator sets of 20 kw each, substituting and installing ten motors of sizes ranging between 20 anl 7½ hp for old ones now in use, altering and improving boilers, piping and other incidental work in remodeling the present lighting and power system of the State capitol. Plans and specifications can be obtained on a deposit of $50.

ELLENDALE, N. D.—The Ellendale Light & Power Company contemplates erecting an electric lighting plant in this town.

WILMOT, OHIO.—The Valley Telephone Company has increased its capital stock from $1,000 to $5,000.

YOUNGSTOWN, OHIO.—The Bell Telephone Company is making arrangements to erect a new building in this city.

ELYRIA, OHIO.—Citizens Gas & Electric Company has applied for an extension of its electric lighting franchise in Elyria.

GEORGETOWN, OHIO.—The City has sold $15,000 bonds for the purpose of enlarging and improving the municipal light plant.

COLUMBUS, OHIO.—The board of public service has recommended to the council the appropriation of $140,000 for new machinery for the electric light plant.

COLUMBUS, OHIO.—The sinking fund commission of this city has sold bonds to the amount of $35,000 for the purpose of enlarging and completing the municipal lighting plant.

GALION, OHIO.—The Galion, Mt. Gilead & Delaware Electric Railway Company has filed articles of incorporation with a capital stock of $10,000. The incorporators are John McNeal and others.

LORAIN, OHIO.—The Black River Telephone Company has decided to purchase equipment and supplies for important extensions to its switchboard and lines. The work will commence in June.

CLEVELAND, OHIO.—The council adopted the resolution requesting the board of public service to have the wires of the Cleveland Telephone Company and Cleveland Electric Illuminating Company put underground.

KENTON, OHIO.—R. G. & E. M. Kerlin, of Toledo, who recently acquired a controlling interest, have been elected directors of the Kenton Gas & Electric Company. Important improvements are to be made to the plant this summer.

CINCINNATI, OHIO.—The Louisville & Eastern Railway Company, operating in Pewee Valley, in Kentucky, has been sold to F. M. Favure, Edgar Elliott and Harry B. Gates, of Indianapolis, Ind. The road is to be extended to Frankfort, Ky.

CLEVELAND, OHIO.—The Cleveland, Painesville & Eastern Railroad Company has increased its capital stock from $1,000,000 to $1,500,000. The company is making improvements preparatory to the consolidation of the property with the Cleveland, Painesville & Ashtabula Railway.

FOSTORIA, OHIO.—The City Council is securing estimates from a number of manufacturers on the cost of installing a municipal lighting system. It is thought that a plant to supply 150 arc lamps and some commercial lighting will cost about $75,000. Bids will be asked for in the near future.

AKRON, OHIO.—The Wadsworth & Western Traction Company has increased its capital stock from $10,000 to $500,000, and elected the following officers: Charles H. Lahr, president; I. L. Johnson, vice-president; T. W. Wakeman, secretary; W. H. Douglass, general manager; E. D. Eckrode, engineer.

BRYAN, OHIO.—A special election will be held in the near future to vote on a proposition to issue $30,000 of bonds for the purpose of enlarging the municipal lighting plant. The proposition is to install two oil burning or gas engines of about 120-hp capacity each. S. E. Folk is superintendent.

CLEVELAND, OHIO.—The Lincoln Park management, headed by Charles L. Gill, has just closed a contract for a $40,000 lighting plant to be installed in the new park. The apparatus is now on the way and will be put in operation within two weeks. The park was formerly lighted by the Lakewood municipal electric plant.

CINCINNATI, OHIO.—The Procter & Gamble Company, of Cincinnati, has let a contract to the Millikin Brothers' Company of New York, for a large plant to be erected on Staten Island, New York. There will be large docks with electrically operated conveying machinery and a large central power station, the entire plant to cost about $2,000,000.

CLEVELAND, OHIO.—The Everett-Moore syndicate has made arrangements for the consolidation of the Lorain Street Railway and the Avon Beach & Southern Railway. The new management contemplate extensive improvements including the building of the Avon Beach & Southern Railway. About $170,000 will be spent in double tracking and improving the Lorain Street Railway.

ALLIANCE, OHIO.—The Sandy Valley Traction Company has placed a contract for the construction of 13 miles of line. The company is to build an electric railway from Lisbon to New Philadelphia, with spurs extending from Magnolia to Canton, and from Minerva to Alliance, in all about 70 miles of road. The company is capitalized at $1,500,000, but contemplates increasing its capital to $3,000,000.

CLEVELAND, OHIO.—The N. Y. P. & O. Dock Company, of this city, has placed a contract with the Brown Hoisting Machinery Company, of Cleveland, for four large ore-handling outfits to be erected in Cleveland for the opening of navigation in 1907. Each leg of the equipment will be operated by 350-hp motors. A power plant to be equipped with two 500-kw generators will be purchased in the near future.

CLEVELAND, OHIO.—The Cleveland Electric Illuminating Company has increased its capital stock from $3,500,000 to $5,000,000. Part of the money will go to pay for improvements started, as well as those that are contemplated. The company is largely increasing its facilities at the main station. When completed the improvements will add 4,000 hp to the total generating power of the company. A new substation is also being constructed on West 28th Street S. W. Extensions of lines are also planned in addition to another substation.

CLEVELAND, OHIO.—H. T. Yaryan, of Toledo, president of the Yaryan Company, has applied for a franchise in Cleveland for power and lighting service. It is proposed to establish a number of plants about the city and furnish electric light and hot water heating. It is proposed to furnish electricity for light, heat and power at a cost not to exceed 10 cents per unit and the rate for arc lights for street lighting purposes is to be less than $60 each per year. The measure gives the city the right to buy the lighting plant at the end of 15 years at cost of reproduction plus 20 per cent.

GRESHAM, ORE.—M. F. Donohue has secured a franchise to light this city for a period of 25 years. Power will be developed from Badger Creek.

PORTLAND, ORE.—An ordinance is being considered by the City Council, which if passed, will result in the placing of all electric, telephone and telegraph wires under ground.

PORTLAND, ORE.—The council has granted the Cascade Power Company and the Mount Hood Electric Company a 25-year franchise to construct and operate an electric light and power system in this city.

FALLS CITY, ORE.—The City Council is reported to have granted the Luckiamute Valley Water & Electric Manufacturing Company a franchise to operate as an electric light, power and manufacturing company. Z. Henshaw and G. T. Hale are among the directors.

ALBANY, ORE.—The Willamette Valley Company has completed its transmission line to Corvallis, and is now supplying the town with electricity from the Albany plant. The old electric plant in Corvallis, which was recently purchased by the company, has been closed down. It is stated that Albany will soon have a 24-hour service for light and power.

NEWBERG, ORE.—The Newberg Electric Light Company and the Spaulding Logging Company have been consolidated under the name of the Yamhill Electric Company. The company has been incorporated with a capital stock of $25,000, and will build a new plant of 300 horse-power on the Willamette River, which it expects to have completed and in operation by fall.

BAKER CITY, ORE.—Press reports state that Dominicus J. Wilson, of Boise, Idaho, has filed notice for appropriation of 8,000 cubic feet per second of the flow of Snake River for power purposes at Ox Bow Bend in Baker County, Ore. He proposes to construct a dam, tunnels, etc., and develop about 40,000 horse-power to be transmitted to Seven Devils, Sumpter, Greenhorn and Elkhorn mining districts, and also to the cities of Ontario, Weisel, Payette, Huntington and other cities along the line, for light and power purposes.

PORTLAND, ORE.—Every light, power and traction company in the lower Willamette Valley, including Portland, using electrical energy, has been consolidated. The purchasers are E. W. Clark & Company, of Philadelphia, Pa.; J. & W. Seligman and Charles Pratt & Co., of New York, N. Y. The various companies which were absorbed are: The Portland General Electric Company, Portland Railway Company, Oregon Water Power & Railway Company, of Portland, Ore.; Citizens' Light & Traction Company, of Salem, Ore.; Vancouver Light & Power Company, of Vancouver, Wash.; and the Union Light & Power Company, of Silverton, Woodburn and Mount Angel, Ore. The headquarters of the new company will be in Portland. The price paid for the combined plants was $30,000,000.

NEW BEDFORD, PA.—The New Bedford Telephone Company has purchased a site, on which it will erect an exchange building.

PITTSTON, PA.—The Council refused to grant a franchise to the Pittston Light, Heat & Power Company to do business in this city, as the city has been restrained from entering into a municipal contract with the company.

NEW HAVEN, PA.—At a recent meeting of the Town Council the question of erecting an electric light plant was discussed and a committee appointed to investigate and estimate the cost of installing a plant. The members of the light committee are R. F. Sheppard, Resin Moore and Harmon Hay.

STROUDSBURG, PA.—The mayor has vetoed the electric lighting contract as passed by the Council, stating that he thought ten years too long a time to be confined to a certain make of lamp, which may become impracticable in a much shorter time on account of the rapid improvements in electrical appliances.

ANDERSON, S. C.—The plant of the Anderson Water, Light & Power Company, at Portman Shoals, about ten miles distant, was destroyed by fire recently. This was a comparatively new development and represented a considerable outlay of money.

ORANGEBURG, S. C.—W. C. Wolfe, of Orangeburg; E. C. Johnson, of North, and associates, will apply for a charter for an interurban electric railway from North to Orangeburg. and on to the Santee River. The capital named in the application for the charter is $1,100,000 The pro-

moters also plan to develop a water power on the Edisto River, near Orangeburg. The total mileage is 45 and includes an electric street railway system in Orangeburg.

SPARTANBURG, S. C.—The Electric Power & Manufacturing Company, which owns Nesbitt Shoals, Spartanburg County, Palmer Shoals, in Cleveland County, N. C., and Gaffler Shoals in Cherokee County, has sold a controlling interest in the property to E. L. Jennings, R. C. Crawford and Lowndes Kennedy, of Pittsburg, Pa. It is reported that about $800,000 will be expended in developing the water power. W. E. Burnett and T. E. Moore, both of Spartanburg, will be directors of the new company.

STURGIS, S. D.—The Sturgis Power & Light Company is getting estimates for putting in another engine, probably condensing, and a generator, as the present unit is overloaded. U. S. Allison is manager.

NASHVILLE, TENN.—The Board of Aldermen has granted a franchise to the Home Telephone Company to install and operate a telephone system in this city.

SPARTA, TENN.—At the annual meeting of the Gainesboro Telephone Company it was decided to issue bonds to the amount of $100,000, for extensions and improvements to its system. Joel H. Anderson was elected general manager to succeed J. N. Cox, who recently resigned.

FORT WORTH, TEX.—The Northern Texas Traction Company contemplates making extensive improvements in Fort Worth during the next few months.

AMARILLO, TEX.—The Amarillo Gas Company, recently incorporated, with a capital of $50,000, has a 50-year gas and electric franchise. It will expend this year between $35,000 and $50,000. The directors are J. C. and F. J. Storm, of Kirksville, Mo., and L. S. Stowell, of Amarillo.

FT. SAM HOUSTON, TEX.—Bids will be received by L. J. Fleming, Constructing Quartermaster, U. S. A., Ft. Sam Houston, until June 14, for furnishing electric current for illuminating and small motor purposes at Ft. Sam Houston; also for the construction of a complete exterior and interior electric lighting system, with fixtures, etc., at this post.

SALT LAKE CITY, UTAH.—It is stated that arrangements have been made between the Ogden Rapid Transit Company and the Utah Light & Railway Company for the furnishing of power by the latter company to operate the street car lines of the former.

SHELBURNE FALLS, VT.—Dr. W. S. Webb has purchased the power plant and mills at Shelburne Falls. He will utilize the plant to furnish power for electric lights at Shelburne Farms, taking the place of the 100-hp steam power plant.

BURLINGTON, VT.—The contract for the addition to the municipal lighting plant has been awarded by the electric light commissioners for a motor generator to the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., for $1,353. It is expected that the addition will be completed August 1. When completed the city lighting plant will have a capacity of 300 kw at its disposal.

ESSEX JUNCTION, VT.—S. A. and C. W. Brownell have resumed work on the hydro-electric installation on the Winooski River at this place. The plans for development were made by Loring N. Farnum & Company, of Boston, and call for three units each consisting of a pair of thirty-inch turbines of 700 hp, operating on a horizontal shaft and directly connected to a 400-kw, three-phase, 60-cycle, revolving field generator delivering current at 6,600 volts. Only one of the units will be installed at present. Step down transformers will be installed to reduce the voltage from 6.600 for use in Essex Junction, while that going a greater distance will be kept at 6,600. The contract to furnish the electrical apparatus was awarded to the Stanley Company, of Pittsfield, Mass., and the water wheels to S. Morgan Smith Company, of York, Pa. Carl B. Brownell, of Burlington, has charge of the construction. It is expected to have the plant in operation in October.

MANASSAS, VA.—The citizens have voted to issue $50,000 bonds for water works, an electric light plant, etc.

NORFOLK, VA.—The new power house of the Norfolk & Portsmouth Traction Company will be built on the old Anderson mill site, at the foot of Lovett Avenue in Brambleton. The plant will be constructed under the supervision of Sargeant & Lundy, of Chicago, Ill., and will cost when completed about $800,000.

PETERSBURG, VA.—An ordinance is now before the City Council to permit the Petersburg Telephone Company to lay conduits and build the necessary manholes for putting wires underground in the center of the city

PASCO, WASH.—The City Council has granted F. E. Elmendorf, of Spokane, a franchise for water works and an electric light plant.

CHENEY, WASH.—The City Council has granted Mr. Lund and associates a franchise for an electric light and power plant; also for a street railway.

OLYMPIA, WASH.—Seattle capitalists represented by A. F. Kincaid, secretary State Board of Control, and C. W. Schaffer, State Librarian, will petition the City Council for a franchise for an electric lighting and heating plant.

NEENAH, WIS.—Plans are being made for the consolidation of the interests of the Eastern Wisconsin Railway & Light Company. The Winnebago Traction Company, the Wisconsin Traction Light, Heat & Power Company and the Green Bay Traction Company.

MILWAUKEE, WIS.—At a recent meeting of the directors of the Wisconsin Telephone Company it was decided to expend $750,000 in improvements and extensions, $500,000 to be used in improving the service in Milwaukee, and the balance on the line out in the State. The following officers were elected: President, Alonzo Burt, Milwaukee; treasurer, Thomas Balch, Boston; assistant treasurer, C. J. Lins, Milwaukee; secretary, Charles Grant, Boston; general manager, E. B. Cottrill, Milwaukee.

BATTLEFORD, CAN.—The Council is considering the construction of an electric light plant.

NORTH BATTLEFORD, CAN.—J. A. Gregory & Company are advertising for a company to install a telephone system to connect this town with Battleford. A guarantee of 100 telephones is offered to commence with.

PACHUCA, MEX.—The Compañia Electrica é Irrigadora de Hidalgo, now operating a big plant at Tlaxcoapam, will establish a new plant at Mixquiahuala, which is within a short distance of the old plant. The machinery, electrical supplies and poles have been ordered and the installation will begin as soon as the supplies are on the ground.

CARMAN, MAN.—The Council is preparing a bylaw to authorize the expenditure of $58,000 on an electric lighting plant. Address A. Malcomson, clerk.

WINNIPEG, MAN.—Bids will be received by Alderman J. C. Gibson, chairman fire, water and light commission, until June 4 for two 500-hp electric generators, switchboards, etc., for high pressure fire service water works. Specifications and forms of tenders may be obtained on application to H. N. Ruttan, city engineer.

KINGSTON, ONT.—An election will probably soon be held to vote on issuing $85,000 bonds for extending the municipal electric light plant.

OTTAWA, ONT.—The bill to incorporate the telegraph company, which is to operate the telegraph and telephone lines of the Grand Trunk Pacific, was passed in the Ottawa House of Commons; the capital stock is placed at $10,000,000. The incorporators are Charles M. Hays, Frank W. Morse and others.

TORONTO, ONT.—A franchise has been granted the Independent Long Distance Telephone Company, by the private bills committee. The sum of $200,000 must be spent within one year by the company or the Bell Telephone Company will retain the right to make exclusive contracts, and if this sum is not spent in two years the franchise will be forfeited.

Company Elections.

MANCHESTER, MASS.—At the annual meeting of the stockholders of the Manchester Electric Co., the present board of officers was re-elected as follows: Oliver T. Roberts, president; George C. Lee, Jr., treasurer; Raymond C. Allen, clerk; Philip Dexter, Gordon Abbott, Gardiner M. Lane and Charles E. Cotting, directors.

COLUMBUS, GA.—At the annual meeting of the Columbus Automatic Telephone Company the following officers were elected: Captain T. E. Blanchard was re-elected president; J. L. Norman, vice-president, and J. B. Huff, secretary and treasurer.

New Incorporations.

AUGUSTA, ARK.—The City Power, Light & Water Company has been incorporated with a capital stock of $50,000. The incorporators are J. A. Vinson and others.

LOS ANGELES, CAL.—The Redondo, Hermosa & Belvidere Railway Company has been incorporated with a capital stock of $100,000. The directors are J. G. Palmer, E. A. Smith, R. L. Antisdel, M. Giles and C. F. Carlson.

TELLURIDE, COL.—The Institute Electric Company, of Telluride, has been incorporated with a capital of $1,000,000 to manufacture and sell electric power and light, the acquirement of water rights, etc. The officers are Wm. Story, president; Albert L. Woodhouse, general manager; E. C. Lackner, secretary.

GRAFTON, ILL.—Articles of incorporation have been filed by the Grafton Light, Heat & Power Company, with a capital stock of $8,500, by L. T. Westrich and others.

GALESBURG, ILL.—The Home Light & Power Company has been incorporated with a capital of $10,000. The incorporators are W. S. Cameron, Harry Gardt and others.

ELGIN, ILL.—The Elgin Merchants' Light Company has filed articles of incorporation with the Secretary of State with a capital of $2,500. The incorporators are John H. Stickling, John Rienert and Frank H. Stickling.

LITCHFIELD, ILL.—The St. Louis, Champaign & Decatur Railway Company has been chartered to construct an electric interurban line from Litchfield to Champaign. The capital stock is $100,000. The incorporators are Charles Zilly and others.

INDIANAPOLIS, IND.—The Central Railway Company of Indiana has been incorporated with a capital stock of $100,000, by Charles H. Burras, of Chicago; E. E. Flickinger, John V. Wagoner, William House and L. B. Mueer, of Indianapolis. The company proposes to build an electric railway about 100 miles long, with its principal power house and terminal at Brownsburg.

TOPEKA, KAN.—The Topeka Independent Telephone Company has been incorporated with a capital stock of $1,000,000. The incorporators are D. L. Pankey and others.

SUMRALL, MISS.—The Sumrall Telephone & Telegraph Company has been incorporated with a capital stock of $5,000, by J. B. Anderson and others.

SARCOXIE, MO.—The Sarcoxie Telephone Company has been incorporated with a capital stock of $5,000, by H. B. Boyd and others.

ST. LOUIS, MO.—The Century Lighting Company has filed articles of incorporation with a capital stock of $100,000. The incorporators are T. P. Cronin, E. G. Ranken and others.

SPRING GREEN, NEB.—The Spring Green Telephone Company has been chartered with a capital stock of $4,800, by W. T. McKinney and others.

SMITHFIELD, NEB.—The Smithfield Mutual Telephone Company has been incorporated with a capital stock of $3,000. The incorporators are C. A. Powell and others.

NEW YORK, N. Y.—The East Steamship Telephone Company has filed articles of incorporation with a capital stock of $5,000. The incorporators are Frank Anable and others.

VAN WERT, OHIO.—The Cleveland, Van Wert & Indiana Traction Company has been chartered with a capital stock of $10,000, by I. R. Tudor, Lee R. Bowewitz and others.

RIVERHEAD, L. I., N. Y.—The Quantuck Electric Company has been incorporated, with a capital of $50,000. Directors: Everett B. Sweezy, of New York, N. Y.; Wm. H. Sweezy, and Robt. P. Griffing, of Riverhead, and others.

CENTREVILLE STATION, N. Y.—The Centreville Lighting Company has filed articles of incorporation with a capital stock of $100,000. The directors are Nathan Lubow, L. W. Lubow and I. D. Wolf, of Centreville Station.

MT. ORAB, OHIO.—The Mt. Orab Telephone Company has filed articles of incorporation with a capital stock of $10,000. The incorporators are A. R. Watson and others.

GEORGETOWN, OHIO.—The Brown County Independent Telephone Company, of Georgetown, has been organized by Louis Meischlor, E. H. Kennedy, C. E. Brehm, Harry E. Parker and J. R. Moore. Capital stock is $10,000.

CANTON, OHIO.—The Minerva Telephone Company, of Stark County, has been incorporated with $4,000 capital stock by E. D. Shaw, R. T. Davis, A. A. Bates, C. G. Hursh, B. C. McCauley and W. E. Russell.

HUSTON, OKLA.—The Huston & El Reno Telephone Company has been incorporated with a capital stock of $5,000. The directors are Charles Bradley, W. J. Murray, J. W. Cordray, S. C. Porter, W. F. Foster, of El Reno, and W. D. McRay, of Huston.

GUTHRIE, OKLA.—The Oklahoma City & Shawnee Traction Company has been incorporated with a capital stock of $1,200,000. The principal office will be at Oklahoma City. The proposed line will be about 40 miles in length. The directors are: Sherman Collin, of Ithaca, N. Y.; W. H. Crane, of Adrian, Mich.; Douglas B. Crane, J. B. Kinne, Daniel Ketchum, William F. Young and Oscar B. Hartman, of Oklahoma City.

ENON VALLEY, PA.—The Enon Valley Telephone Company has been incorporated with a capital stock of $10,000.

VETERA, PA.—The Nicktown & Ebensburg Telephone Company has been incorporated with a capital stock of $5,000.

PHILLIPSBURG, PA.—The Decatur Township Electric Light, Heat & Power Company has been incorporated with a capital stock of $5,000.

PHILLIPSBURG, PA.—The Rush Township Electric Light, Heat & Power Company has been incorporated with a capital stock of $5,000.

FAIRCHANCE, PA.—The Fairchance & Smithfield Traction Company has been incorporated with a capital stock of $200,000. The incorporators are Albert Gaddis and others.

ALPENA, S. D.—The Alpena Farmers' Phone Company has filed articles of incorporation with a capital stock of $4,500. The incorporators are J. E. Shull and others.

NASHVILLE, TENN.—The Laurel Valley Railroad, of Carter County, has been chartered with a capital stock of $10,000. The company proposes to construct a railroad to be operated by steam or electricity, from a point near Hampton, Tenn., to Elk River, in North Carolina.

CHATTANOOGA, TENN.—The Chattanooga Railways Company has applied for a charter for the purpose of improving and rebuilding its lines on the top of Lookout Mountain. The capital stock is $100,000. The incorporators are Foster V. Brown, Frank Spurlock, R. W. King, D. J. Duncan and Thomas G. Newman.

BALLINGER, TEX.—The Consumers' Light Company has been incorporated, with a capital of $20,000 by Thomas Ward, J. Wilmeth, W. A. Norman and others, all of Ballinger.

AUSTIN, TEX.—The Mt. Zion & Lost Creek Telephone Company, of Gordon, has filed articles of incorporation, with a capital stock of $1,000. The incorporators are W. H. Rix and others.

BROWNWOOD, TEX.—The Brownwood Gas & Electric Company, of Brownwood, has been incorporated, with a capital of $80,000, by S. P. Coggin, R. B. Rogers and others, all of Brownwood.

WEATHERFORD, TEX.—The Weatherford Telephone Company has filed articles of incorporation with a capital stock of $50,000. The incorporators are J. A. Murray, J. Castler, G. A. Holland, R. S. Lowe, W. D. Carter, C. C. Littleton, J. T. Cotton, E. P. Sawtill and R. A. Armstrong.

LEVEL RUN, VA.—The Renan Telephone Company has been chartered with $5,000 capital. The officers are W. C. Harvey, president, Renan, Va.; E. A. Smith, secretary and treasurer.

NORFOLK, VA.—The Norfolk & Portsmouth Traction Company has been incorporated with a capital stock of $14,000,000. The incorporators are R. Lancaster Williams and others.

HAMPTON, VA.—The Public Service Corporation of Hampton has been incorporated by J. W. Rowe, H. F. Elam and S. C. Rees, all of Hampton, Va., with a capital of $300,000, to produce and distribute light, heat, power and compressed air.

SPOKANE, WASH.—The Spokane Power Development Company has been formed with a capital of $500,000 to construct and operate power plants in Washington, Idaho, Oregon and British Columbia. Directors: Jay P. Graves, F. A. Blackwell, F. Lewis Clark, and others.

PARKERSBURG, W. VA.—The Sun Light Company of this place has been incorporated with a capital stock of $5,000. Robert G., Samuel B., Albert and Meggs Stiles and others are the incorporators.

MILWAUKEE, WIS.—The Milwaukee Telephone Company has been incorporated with $100,000 capital.

HIGHLAND, WIS.—The Individual Telephone Company has been incorporated with a capital stock of $800. The incorporators are John J. Yerke and others.

ATTICA, WIS.—The Attica Mutual Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are Oliver S. Jones and others.

MILWAUKEE, WIS.—The Milwaukee, Rockford & Eastern Railway Company has filed articles of incorporation with a capital stock of $100,000. The company proposes to build 75 miles of road in Milwaukee, Waukesha, Walworth and Rock counties. The proposed route will run from Milwaukee to Beloit. H. W. Seaman is the principal stockholder.

LARAMIE, WYO.—The Medicine Bow Telephone Company has been incorporated with a capital of $10,000 by Carl Sieverts, R. N. Cronberg, O. P. Reed, J. H. Bowles and A. C. Cooper, to build a telephone line among the ranches of northern Albany and Carbon Counties. The company will have its principal office at Medicine Bow and will extend its lines to a score or more of ranches near that place.

REGINA, CAN.—The Northern Development Company is applying for incorporation with a capital of $500,000 to develop power on the Red Deer and Etoimomi Rivers. The incorporators are: O. A. Roderbon, A. L. Nanton, John Galt (Toronto), F. J. Fox and John Shough.

WINNIPEG, MAN.—The Siche Western Company has been incorporated to manufacture electricity, etc. The provisional directors are E. C. Colby, G. H. Mauier, Winnipeg, and E. C. Foley, Montreal, Que.

DOUGLAS, ONT.—The Douglas Milling Company has been incorporated with a capital of $40,000 to manufacture electricity for lighting and heating purposes. The directors are T. M. Thrasher, A. McEachern, O. Enright, of Douglas, Ont.

Legal.

PRIVATE BRANCH EXCHANGES.—An injunction restraining the Chicago Telephone Company from discontinuing the service on three trunk lines running into the office of John A. Gauger & Co., Twenty-second and Laflin Streets, has been granted by Judge Walker. The injunction restrains the telephone company from interfering in any way with the private switchboard and seven extension instruments installed in place of the instruments owned and furnished by the telephone company. The bill for an injunction was filed by Beach & Beach, who also secured an injunction against the telephone company which has been pending in the courts since November, 1903. The present fight is to establish the right of subscribers to install private switchboard and extension instruments and attach them to the lines of the telephone company if desired. The Gauger equipment cost outright $350, while the firm had paid $150 a year to the company for the leased apparatus. The dispute involves the right of the company to keep alien apparatus from tapping or connecting with its system.

DAMAGES TO KITE FLYER.—In the superior civil court at Salem, Mass., before Judge Fox, in the case of Melvin A. Deering p. p. a. vs. Gloucester Electric Company, the jury returned a verdict for the defendant. This was an action to recover damage for an electric shock and burning of plaintiff, a 10-year-old lad, received while trying to get a kite off the wire which had fallen on Centennial Avenue in this city. The plaintiff claimed negligent construction and care of the wires, while the theory of the defence was that the wires had been drawn together and burned off by the kite and was not due to any defect or want of care. This contention prevailed.

CUTTING TREES.—In the suit of Osborne against the Auburn Telephone Co., the New York Supreme Court Appellate Division, Fourth Department, has affirmed a dismissal of complaint on its merits, in favor of the defendant. In a suit to restrain a telephone company from erecting its poles and stringing its wires in a street, and for damages occasioned by the destruction of shade trees, it appeared that the company had a franchise to erect its poles and string its wires in the streets, that poles were erected in a street on which plaintiff's property abutted, and that the company had trimmed plaintiff's shade trees. The proof did not show to what extent any particular tree was damaged, or whether the premises

were depreciated in value by the cutting of the trees. It was held that the company was lawfully in the streets, and not subject to plaintiff's interference simply because it erected poles contiguous to her premises, and a judgment of dismissal was proper for failure to prove damages. Where an owner of land abutting on a street planted trees along the street, and the city acquiesced in his ownership of them, he had sufficient title to recover damages against a telephone company wrongfully cutting down the trees, though his title did not include any part of the street.

ELECTRICITY A PUBLIC USE.—The New York Supreme Court Appellate Division, Fourth Department, has affirmed an order, in the case of the Niagara, Lockport and Ontario Power Co. against Harke, permitting plaintiff to enter immediately upon certain lands, on the ground that it is a "public use." The plaintiff had already entered into a contract for the construction of a canal, which is in process of building, and which, when completed, will be of sufficient capacity to generate 200,000 electrical horse-power. It had entered into an agreement with a Canadian power company to receive a large quantity of electric power, a considerable portion of which is ready for delivery. "It has also entered into an agreement with a construction company for the delivery of power to be used in the operation of certain street surface railroads, which are named in the moving papers, and the affidavits show that it is important that this power be delivered early during the present year. The contract calls for the delivery of this power at an early date, and the plaintiff is actively prosecuting the building of its line. The transmission of the electricity is at high voltage and along wires nine-tenths of an inch in diameter, which are supported by steel towers 50 feet in height. To transmit the electricity of the extraordinary high voltage of from 10,000 to 60,000 volts in wires along the streets or highways would be dangerous and impracticable. The extent of the business contemplated, including, as it does, the furnishing of electricity for the use of the inhabitants in a thickly settled and extensive territory for illuminating purposes, and for the use of extensive street surface railroad, we think constitutes a public use within the definition of that comprehensive term. The fact also sufficiently appears that 'the public interests will be prejudiced by delay' if the defendant is allowed to block the plaintiff in the fulfillment of the plan for which it was organized and retard the furnishing of electricity or water to the inhabitants along its route, or in supplying electrical power for the operation of railroads and for other necessary purposes which may fairly be for the benefit of the public."

Obituary.

R. J. SHEEHY.

MR. ROBERT J. SHEEHY, whose death was briefly noted in our issue of May 5, was born in Ireland in 1843 and came to this country with his parents when he was four years old. In 1854 he began his business career as a telegraph messenger, and during the period between 1862 and 1868 was a line builder for the old American Telegraph Company, the Franklin and other companies then in existence. He was identified with the introduction of the Stearns duplex, about the practicability of which there was much skepticism at the time. In 1871 Mr. Sheehy went to the newly organized Gold & Stock Telegraph Company in Boston and did some good work in building up the company's business in that city. He left the telegraph service in 1875 and began business for himself in the construction of electrical apparatus; and up to the time of his death he had taken out 50 or more patents on inventions relating to the various branches of electrical engineering. It is stated that in the early days Mr. Edison, in pursuing his own work, frequently ran up against Mr. Sheehy's patents, which led Mr. Edison to remark that Mr. Sheehy was a "prolific inventor." In 1878 Mr. Sheehy installed the first Brush arc lighting plant in Boston, at the Mechanics' Charitable Fair, and afterwards installed a large Brush machine in the Washburn & Moen rolling mills in Worcester, Mass. In 1879, he produced one of the earliest search-lights. He used an ordinary locomotive headlight reflector, and the strong light caused much speculation at Nantasket Beach, where the experiments were conducted. Mr. Sheehy was instrumental in developing the Brush interests in the East and was one of the founders of many of the Brush Companies organized in that section of the country. In 1885 he resumed experimental work and invented and patented printing telegraph instruments, a multiplex system and an autographic instrument, using an alternating-current motor of his own invention for driving the various devices. In 1890 he organized a company to introduce a printing telegraph system designed for the interchange of communications between business houses on the exchange principle. His latest inventions consisted of the "Telotype," said to be a simple, rapid and reliable printing telegraph system, and an electric train controlling system for steam and electrically-operated railways. A couple of years ago he went to England to introduce the two latter inventions, and organized an English company to exploit his train control system. He returned to this country a few weeks ago in ill health. Deceased was of a genial nature and had a large circle of friends, who feel deep regret over his death.

MR. C. F. THOMPSON.—We note with regret the death of Mr. C. F. Thompson, for many years secretary and treasurer of the Brattleboro (Vt.) Gas Light Company, controlling the gas and electric light interests of Brattleboro. He was born at Seymour, Conn., in 1831.

MR. CHRIST HOLSCHER, general manager of the Holscher Electrical Manufacturing Company, of Warren, O., died suddenly last week at the age of 55. He invented a number of electrical devices, and the company bearing his name makes refilled incandescent lamps.

Educational.

WINONA (IND.) TECHNICAL INSTITUTE.—A series of interesting lectures will be given at the electrical building at the Winona Technical Institute in Indianapolis, Ind. The first will be by J. G. Van Winkle of the Varney Electric Company, on "An Engineer's Views of Light and Power Wiring."

Personal.

G. R. NEWCOMER.

MR. G. R. NEWCOMER, who was for years connected with the Columbia Incandescent Lamp Co., in charge of its Memphis office, has accepted the position of district manager of the Brilliant Electric Co., Cleveland, O., to take effect May 1, 1906, in which capacity he will take charge of the selling organization in the Middle West and South, with temporary headquarters at Kansas City. Mr. Newcomer has been in the electrical business since 1893, during which time he has covered the greater part of the United States in the interests of several of the largest electrical concerns in the country. For several years he was directly in charge of the selling organization of the United States Carbon Co., severing his connection with that company to accept a position in charge of the Southern territory of the Columbia Incandescent Lamp Co. Mr. Newcomer remained in charge of the Memphis office of this company until July, 1905, at which time ill health made it necessary to retire from active business until now.

MR. J. G. SIGLER, local manager for the Kinloch Telephone Company, of St. Charles, Mo., has resigned that position to accept a more lucrative one in New York.

MR. C. F. HEINKEL, who has been general designer for the Elwell-Parker Electric Company of America, of Cleveland, O., for the past seven years, has been promoted to be chief draftsman of that company.

MR. R. McF. DOBLE.—As a result of the great earthquake and fire, Mr. Robert McF. Doble, consulting and supervising engineer, announces the removal of his office from San Francisco to Colorado Springs.

MR. J. A. BENDURE, for the past five years general manager of the Lima Railway & Light Company and the Lima & Toledo Traction Company, has resigned to become associated with Mr. Joseph B. Mayer, of Buffalo.

MR. SIDNEY E. JUNKENS and Mr. Henry R. Kent have been elected vice-presidents of Westinghouse, Church, Kerr & Company. For many years past Mr. Junkens has been secretary of this engineering company.

MR. FRANK N. WATERMAN, mechanical and electrical engineer, has removed his offices from 150 Nassau Street to 100 Broadway, New York, instead of the reverse, as erroneously announced in these columns last week.

MR. W. M. ZURFLUH, superintendent of the Home Lighting, Power & Heating Company, of Springfield, Ohio, has resigned to become superintendent of the Arcade Building electric light, heat and refrigeration plant at Dayton, O.

MR. W. J. WARDER, JR., of the engineering staff of the Western Electric Company, located recently in New York, on May 1, took the position of designing engineer for Roth Bros. & Company, of Chicago, dynamo and motor builders.

MR. C. F. BAKER, superintendent of power of the Brooklyn Rapid Transit Company, has resigned and Mr. C. E. Roehl, electrical engineer, will, in addition to his other duties, have charge of the operation of all power and sub-stations of the various companies comprising Brooklyn Rapid Transit system.

MR. GEORGE WESTINGHOUSE is the theme of an interesting article by Mr. Arthur Warren in the May *Success*. It deals with the career of this unique but typical American in all his various aspects of inventor, mechanic, promoter, capitalist, etc., and brings out the events with broad philosophical treatment.

DR. G. VAN DAVIS writes us from the Emergency Camp, Presidio, San Francisco, that he has lost his library, equipment, etc., and being thrown out of professional work would like to secure some immediate

means of livelihood in handling electrical goods or specialties of any kind, or anything useful in the rebuilding of the city.

MR. F. S. HICKOK, formerly on the engineering staff of the Western Electric Company, of Chicago, and recently connected with Mr. Edward Yeoman in the sale of electric cranes and hoists, has opened an office for himself at 824 Marquette Building, Chicago, as representative of the Case Manufacturing Company, Columbus, O., manufacturers of electric cranes and hoists.

MR. HENRY DOCKER JACKSON, Boston, Mass., has opened offices at 4 State Street, as consulting electrical engineer. Mr. Jackson will make a specialty of electrolysis and power station economy. He has for several years lectured at the Massachusetts Institute of Technology on the subject of electrolysis, having had extensive practical experience in the investigation of electrolytic action.

MR. JAMES R. CRAVATH lectured on illuminating engineering at the University of Minnesota the evening of April 27. In addition to the students a large number of men from the commercial and new business departments of the St. Paul and Minneapolis central station companies were present. Mr. Cravath lectured on the same subject before the Chicago Architects' Business Association, April 24.

MR. WM. CLEGG, JR., who has been special agent of the Westinghouse Electric & Mfg. Company in its St. Louis territory, has just received the appointment of acting manager of the St. Louis office. Mr. D. E. Webster, formerly manager of the office, has been transferred to a position in the Chicago sales office of the company. Mr. J. S. Tritle has been appointed acting manager of the new district office opened by the Westinghouse Electric & Mfg. Company, New England Building, Kansas City, Mo. Mr. Tritle was formerly connected with the St. Louis office of the company.

MR. A. BALSLEY has resigned as electrical engineer for the Georgia Railway & Electric Company, of Atlanta, Ga., to accept a similar position with the Sao Paulo Tramway Light & Power Company, of Sao Paulo, Brazil, South America. Mr. Balsley after graduating from the Rose Polytechnic Institute, Terra Haute, Ind., and finishing a course in the Lynn factory of the General Electric Company, at Lynn, Mass., became superintendent of the Terre Haute Electric Company, which position he held for several years and later became connected in a similar capacity with one of the Montreal transmission companies, from which place he went to Atlanta. He sailed April 5 for Sao Paulo.

MR. THOMAS E. MURRAY, vice-president of the New York Edison Company, and an officer of the Chattanooga & Tennessee River Power Company, performed a very useful service to the American Society of Mechanical Engineers of which he is a member, by compiling for that body and presenting to those in attendance at the recent convention a handsome souvenir volume of data as to Chattanooga and its environs, enterprises, power plants, history, etc. The text and the numerous illustrations are alike admirable, particularly all relating to the battlefields of Chickamauga, Lookout Mountain and Missionary Ridge, where the greatest American generals and men from thirty-three States struggled for supremacy in the Civil War. Mr. Murray's book contains also an excellent map and account of the Tennessee River power transmission.

Trade Publications.

THE TRUMBULL ELECTRIC MFG. COMPANY, Plainville, Conn., has just issued a 100-page catalogue of electric wiring material.

LOCOMOTIVE CRANES.—The Browning Engineering Company, Cleveland, Ohio, has issued bulletin No. 23, dealing with locomotive cranes. The bulletin is profusely illustrated.

MOTORS FOR DRIVING MACHINE TOOLS.—Bulletin No. 64, of the Crocker-Wheeler Company, Ampere, N. J., is devoted to a complete line of motors, especially adapted to the driving of machine tools.

IGNITION APPARATUS.—The Uncas Specialty Company, 21 Shipping Street, Norwich, Conn., has issued an illustrated booklet dealing with electrical ignition apparatus for gas engines, including Leavitt secondary distributor and primary spark timers.

NERNST GLOWER.—The April issue of the Nernst Glower contains many items of interest to central station men including descriptions of illuminating installations, methods for meeting gas competition and helpful hints to hustling advertisers.

EXHAUST HEADS.—The B. F. Sturtevant Company, Boston, Mass., has issued a folder to which is attached a return postal calling attention to its exhaust head which is designed to entrap the water and yet to produce no back pressure on the engine.

THE DE LA VERGNE MACHINE COMPANY, of New York, has issued a set of handsome postal cards showing the different types of machines built by it, namely the Koerting Gas Engine, the Hornsby-Akroyd oil engine and the De La Vergne ice machine.

ELECTRICAL AND STEAM MACHINERY.—Joseph H. Thompson, Jr., 11 Broadway, New York, has issued bargain list No. 5 giving the capacity ratings of numerous electrical and steam machines which have been renovated and are in condition for immediate delivery.

MACHINE TOOLS.—The Niles-Bement-Pond Company, of New York, in the *Progress Reporter* for May, publishes illustrated descriptions of numerous machine tools, among which may be noted milling machine, checking lathes, slotters, radial drills, boring and drilling machine, rail benders, etc.

SWITCHES FOR LIGHTING CIRCUITS.—Booklet No. 10 of the Hart Manufacturing Company, Hartford, Conn., contains a digest of the types and salient features of "diamond H" switches. Descriptions are given of push-button and rotary switches, plug receptacles and automatic door switches.

BELT CONVEYORS.—The Robins Conveying Belt Company, Park Row Building, New York, has issued a neatly illustrated bulletin, designated as No. 14, which is devoted to conveying and elevating machinery for handling sand, stone, cement, concrete, concrete materials and excavated earth and rock.

AIR BRAKE EQUIPMENTS.—Bulletin No. 4437 of the General Electric Company, Schenectady, N. Y., gives a thorough description of straight air brake equipments for electric cars. Each part of the equipment is treated separately and in detail. A well-arranged diagram serves for showing the connections of the different parts of the system.

MOORE ELECTRICAL CO., 52 Lawrence Street, Newark, N. J., has issued a neat little pamphlet as to its Moore vacuum tube lighting. The frontispiece is the 162-foot tube in the main corridor lobby of Madison Square Garden, New York City. Other views are given, and there are several pages of data, testimonials, etc.

ENGINE STOPS.—The Consolidated Engine Stop Company, 130 East 12th St., New York, has issued a pamphlet containing letters from a large number of well-known industrial plants using the Monarch engine stop and speed limit system. The letters relate to cases of accident where the Monarch system proved beyond a doubt its protective properties.

STEEL BELT LACING.—The Bristol Company, of Waterbury, Conn., announces the publication of bulletin No. 39, a new circular and price-list of Bristol patent steel belt lacing, including several new sizes which the company has recently commenced to make. This circular gives the list in a condensed and tabular form, enabling one to see at a glance the relation which exists between the different sizes and styles.

LIGHTNING ARRESTERS.—The General Electric Company, Schenectady, N. Y., has issued flyer No. 2177, describing a new type of lightning arrester. The arrester consists of a series of spark gaps with cylinder electrodes, so combined with shunt resistances as to provide a highly efficient discharge path for disturbances of low, moderate and high frequency, not only from line to ground, but also from line to line, by means of the multiplex connection.

HORIZONTAL ENGINES.—The B. F. Sturtevant Company, Hyde Park, Mass., has issued as bulletin No. 131 a well-prepared description of its horizontal center-crank engines, which possess all of the features desirable for the driving of direct-connected generators, for which purpose they were particularly designed. Neat half-tones serve for illustrating the main constructional features, while an outline diagram shows the principal dimensions of the engines.

TELEPHONES.—Bulletin No. 19 of the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., is a well-executed, loose-leaf catalogue dealing with generator-call telephones, and showing numerous views of both series and bridging instruments of various styles. Special attention is paid to a new type of transmitter, four-party line selective telephones, "sure-ring" telephones, "non-interfering" telephones, a new type of portable desk telephone and two types of receivers.

ALTERNATING-CURRENT GENERATORS.—Bulletin No. 1050 of the Allis-Chalmers Company, Milwaukee, Wis., deals with alternating-current generators of the water-wheel type. Each of the machines is constructed with a stationary armature and a revolving field. Illustrations are shown of alternators mounted on vertical and on horizontal shafts, and much information is given concerning the performance of the machines, and the details of design which have contributed to its operating characteristics.

ANALYSIS OF COAL.—A descriptive booklet entitled "Little Economics," has been issued by Milton E. Hughes & Company, 324 Dearborn Street, Chicago. After discussing the wastes which exist in the average boiler room, the booklet shows what may be accomplished when proper account is taken of each heat unit obtained from the coal dealer. It is suggested that fuel should be purchased on the basis of the heat units, and mention is made of the fact that the company named is prepared to conduct tests on fuel, boilers, engines, or other machinery.

THE CENTRAL ELECTRIC COMPANY, Chicago, has recently sent out to its trade, a new price list and discount sheet dated April. This price list applies to the company's 1906 general catalogue No. 24 and contains the very latest prices in force on all electrical material. Special attention is called to the fact that new prices are quoted on D. & W. enclosed fuses and safety devices, for which the Central Electric Company is general western agent. This price list should be in the hands of every purchaser of electrical material and any buyer who has not received a copy can secure one on application.

FAN MOTORS.—Special publication No. 7043 of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., is an attractive bulletin dealing with electric fans and small-power motors. Among the numerous half-tone illustrations are shown interior views of homes, offices, stores and banks where electric fans have proved almost indispensable. The motors and the fans, which are also separately illustrated, are either the direct-current or the alternating-current type. The motors are of the constant speed variety and are designed for .05, .08 or .125 horse-power. The alternating-current motors operate on the induction principle and are provided with split-phase windings, the starting coils of which are automatically cut out as the motors reach full speed.

News of the Trade.

THE BUCKEYE ELECTRIC COMPANY and the Jandus Electric Company give 23 Lake Street as their new address in Chicago.

TRIUMPH ELECTRIC COMPANY, of Cincinnati, O., has moved its New York office to the Townsend Building, corner Broadway and Twenty-fifth Street.

KEYSTONE LUBRICATING COMPANY, Allegheny Avenue, Philadelphia, reports Mr. W. A. Campbell as the manager of its Western branch, at 1102 Tacoma Building, Chicago, Ill.

THE NATIONAL BATTERY COMPANY has recently changed its offices from suite 415 to suite 450 in the Old Colony Building, Chicago. The office is under the management of Bertram Smith, who has been doing efficient work for the company during the past year in the western territory.

FAIRBANKS, MORSE & CO., Chicago, have recently sold a large number of their standard mine cars to the Republic Iron & Steel Company, Nassau Ore Company, La Rue Mining Company and the Rhodes Mining Company, for use in these companies' large iron mines in Minnesota.

ELECTRIC WELDING.—A novel arrangement is in use by the Philadelphia Rapid Transit Company, Philadelphia, Pa., for the local welding of track joints. This consists of a small foundry cupola carried on a trolley car and supplied with blast from an electric pressure blower, furnished by the B. F. Sturtevant Co., of Boston, Mass.

THE B. F. STURTEVANT COMPANY, of Boston, Mass., is furnishing direct-connected generating sets, consisting of its own engines and generators, to the Windsor Machine Co., of Windsor, Vt.; Lawton Mills Corporation, Plainfield, Conn.; Simmons Mfg. Co., Kenosha, Wis.; Sanborn Map Co., Pelham, N. Y.; Eagle Brewing Co., Newark, N. J.

AITON MACHINE CO.—On account of the continuel expansion of its business the Aiton Machine Company, of New York, has found it necessary to install a number of new machine tools in its factory at Harrison, N. J. These new tools are all especially adapted to the Aiton work, which is the manufacture of wire, cabling, stranding, insulating and rubber machinery.

FAIRBANKS, MORSE & CO., San Francisco, Cal., now occupy temporary headquarters at 969 Broadway, Oakland, Cal., until they are able to return to their permanent location in San Francisco, where they were recently burnt out. Meanwhile, their many customers are receiving the customary prompt attention and they have never ceased the sale of their well-known specialties, scales, gasoline engines, steam pumps, motors, generators, windmills, etc.

THE GREGORY ELECTRIC COMPANY has just moved into new works at 16th and Lincoln Streets, Chicago. The works occupy practically half a block, and are well equipped with electric traveling cranes, etc., and supplied with excellent railroad facilities, a switch track running into the building. All machine tools are electrically driven, and the endeavor has been to make a model plant throughout perfectly adapted for handling and repairing second-hand electrical apparatus.

THE WM. ROCHE DRY BATTERY CO., of New York, has found its present factory entirely inadequate for the rapidly increasing business and has moved the works to Jersey City where it has a modern plant of sufficient size to fill all orders promptly, a thing which this concern has always endeavored to do. The location of the works is 286, 288 and 290 Clerk Street, Jersey City. The offices and show-rooms are located at 40 West Broadway, corner Park Place, New York City, where a full line in all sizes will be carried.

NORTH ELECTRIC CO., of Cleveland, O., has opened a branch office and warehouse at Kansas City, Mo., where it will carry a large stock of telephones of all kinds, switchboards, construction material and miscellaneous supplies. This branch is in addition to the Dallas branch office and warehouse at Dallas, Tex., and is made necessary in order to take care of the rapidly increasing business in the states adjacent to Kansas City. The company will be prepared to make shipments from Kansas City after May 20. The Chicago office of the North Electric Company has been discontinued. Business west of the Mississippi River will be handled from the Dallas and Kansas City branch offices and warehouses and that east of the Mississippi River will be handled as heretofore from Cleveland.

THE CONNECTICUT TELEPHONE & ELECTRIC CO., of Meriden, Conn., has placed the Pacific Coast agency for its high-grade spark coils with the Geo. P. Moore Co., Inc., of Oakland and Los Angeles, Cal. The establishment of the Moore Company at San Francisco was entirely destroyed by the recent fire, but it has promptly opened up a branch at Oakland and is already carrying a large stock ready for business. The Moore Company carries on hand at all times a complete stock of the well-known "Connecticut" coil. About a year and a half ago, the Connecticut Company realized that there was a chance to improve the electrical sparking equipment of gasoline engines, and with this object in view, began a series of experiments for the purpose of improving this all-important apparatus, with the result that it has produced a coil of very high quality. The Connecticut Company has had 12 years' experience in the manufacture of high-grade electrical apparatus. Nothing but the finest materials enter into its construction.

PELTON WATER WHEEL COMPANY.—Notwithstanding the complete destruction of its San Francisco works in the great fire, the Pelton Water Wheel Company was particularly fortunate. All drawings, books and cost records, so essential to a manufacturing concern, were saved, together with several years' correspondence. In addition, this company has had under construction for several months past new works in San Francisco. These were outside of the fire zone and are being rushed to completion, so that they will be running as usual within a couple of months. In the meanwhile, the well-equipped shops of the company at New York will be utilized for the fulfillment of current orders, so the business will continue practically without interruption. Temporary offices have been established at 1259 Alice Street, Oakland, Cal., to which communications should be addressed. The Atlantic Department is as formerly, 143 Liberty Street, New York. Correspondence is solicited and estimates promptly furnished upon receipt of data.

THE UNDERWRITERS' LABORATORIES of Chicago have started their factory inspection service of flexible tubing at the following factories: The Alphaduct Manufacturing Company, of New York; the American Circular Loom Co., of Chelsea, Mass.; The Osburn Flexible Conduit Co., of Hoboken, N. J. Similar service on unlined conduit is now being made at the factories of the American Circular Loom Co., of Kenilworth, N. J.; Enamel Metal Co., Pittsburg, Pa.; Mark Manufacturing Company, Zanesville, O.; National Metal Moulding Co., Pittsburg, Pa., and Safety Armorite Co., Pittsburg, Pa. Factory inspection services in other lines will be started in the near future. In order to handle the various factory inspections to advantage, as well as their other laboratory work, the Underwriters' Laboratories have established branch offices in various cities and now have representatives in the following places: Chicago, main office and laboratory; New York, Boston and Buffalo, and expect to start branch offices in the near future in Pittsburg and Schenectady. The Wire Inspection Bureau, affiliated with the Underwriters' Laboratories, is now conducting factory inspection service at the establishments of twenty manufacturers of rubber covered wire.

NATIONAL BRAKE & ELECTRIC COMPANY, of Milwaukee, Wis., has issued an announcement to the trade as follows: "The plant and other assets of the National Electric Company were this day formally transferred to the National Brake & Electric Company, a corporation of Wisconsin with a paid-up capital of $1,000,000. The new company, as successor of the Christensen Engineering Company and the National Electric Company, will continue to manufacture air brakes and electrical machinery with extended facilities and abundant working capital. In soliciting a continuance of the patronage with which its predecessors in the business were favored, it takes pleasure in assuring prompt attention to orders, superior workmanship and reasonable prices. As the pioneers in the manufacture of motor driven air compressors and in the adaption of air brakes for electric traction service, it proposes to maintain its leadership by the development of improved devices to meet the new conditions due to the more exacting demands of the present day trade. To facilitate prompt attention to all inquiries referring to prices and sales of its product, the general sales office has been located at No. 519 First National Bank Building, Chicago, Ill., where all correspondence referring to same should be addressed."

THE STANDARD ELECTRICAL WORKS, formerly located at 120-130 New Montgomery Street, San Francisco, have opened a permanent office in the Atlas Building, a 10-story fireproof building at 604 Mission Street, where they have leased office room comprising one-half the ground floor and all the basement for store rooms and are now in a position to fill any and all orders for electrical supplies with their usual promptness. Mr. H. C. Thaxter has assumed the management of this concern and with his usual promtness has chosen one of the best locations in the city for the new headquarters of the firm, whose many friends will be pleased to learn that they have a large stock of supplies on hand ready for immediate delivery. The company still remains one of the leading electrical supply houses on the Pacific Coast as Western agents for the following Eastern manufacturers: Simplex Electrical Co., Simplex Electric Heating Co., Electric Machinery Co., Mechanical Appliance Co., Century Electric Co., American Vibrator Co., Triumph Electric Co., Warren Elec. Mfg. Co., Commercial Electric Co., Jandus Electric Co., Lafayette Elec. Mfg. Co., Duncan Elec. Mfg. Co., Jewell Elec. Instrument Co., DeVeau Telephone Mfg. Co. The Atlas building suffered comparatively little damage from the earthquake or fire. The windows were broken and the woodwork in the upper stories was scorched.

ABNER DOBLE COMPANY.—We have received the following copy of a letter sent out by that company: "During the recent San Francisco fire we suffered some loss, our offices and shops being burned, but we are already resuming business on a larger scale than ever before. We have opened temporary offices at 2611 Broadway, San Francisco, where the business of the company is being conducted for the present. We also have a branch office in Oakland at 668 Broadway. We have now under construction large and new permanent shops and warehouses at Seventh and South Streets, in the Potrero District, where we will have the most completely equipped works on the Pacific Coast. By May 15th part of our manufacturing stablishment will be running full force, and within a very few weeks our entire plant will be in complete operation. We lost in the fire some of our correspondence and drawings. In order to check up our files and make our records complete, we should like to have you send us as soon as possible, copies of all recent correspondence with you that refers to work which has not been closed up. We should also like to have copies of all drawings and blue prints sent you and sent by you to us before the fire. Our organization is intact and we are now ready to take orders and to carry on our business as before. Your efforts in helping us to complete our files will assist us materially and will be very greatly appreciated."

NEW YORK LUNKENHEIMER STORE.—The Lunkenheimer Company of Cincinnati, O., the well-known manufacturer of high-grade engineering specialties, has opened a well-equipped branch store, at 66-68 Fulton Street, New York City. Heretofore the Lunkenheimer Company maintained a suite of offices at 26 Cortlandt Street, through which the export trade of the concern was transacted. While the trade in New York City and Eastern States were able to a great extent to procure Lunkenheimer enginering appliances from the various supply houses, the increased demand necessitated the opening of a branch from which the supply houses and trade in the New York territory could be instantly accommodated. The same courteous attention characteristic of the company will be found to prevail in its new establishment. Being grateful for the patronage of the Eastern trade, it is its endeavor to accommodate the trade by prompt attention to all orders, to do which it has gone to large expense by opening its New York branch store and equipping it with a large and complete line of its many specialties.

Weekly Record of Electrical Patents.

UNITED STATES PATENTS ISSUED MAY 8, 1906.
[Conducted by Rosenbaum & Stockbridge, Pat. Attys., 140 Nassau St., N. Y.]

819,706. ELECTRICAL MEASURING INSTRUMENT; Theodore Abtmeyer, Wilkinsburg, Pa. App. filed Sept. 10, 1904. A form of electric meter having a stationary and a movable coil which are displaced relatively to one another by the current. The motion is counteracted by a tensile spring, the force of which is adjusted and indicated by a pointer and dial.

819,707. AUTOMATIC SPEED INCREASING DEVICE; George Baehr, McKeesport, Pa. App. filed Sept. 17, 1904. A self-regulating system for electric motors whose armatures are constantly under load, comprising a motor, a source of current therefor, and automatic means controlled by the load on the motor and arranged to decrease the strength of the motor-field when the load on the motor armature is increased, and to increase the strength of said field when the load on the motor armature is decreased.

819,738. ELECTRIC MOTOR CONTROL SYSTEM; Adolph H. Daus, Chicago, Ill. App. filed Mar. 17, 1905. A motor control system for operating a cut-out in case the motor armature becomes accidentally grounded. The apparatus is arranged to be sensitive to the flow of a small grounded current but independent of any normal motor current.

819,770. SYSTEM OF ELECTRICAL DISTRIBUTION; Benjamin G. Lamme, Pittsburg, Pa. App. filed June 30, 1904. The combination with a dynamo-electric machine having a shunt field-magnet winding, of an auxiliary machine having its armature in the field-magnet circuit of the main machine and its field-magnet winding in series relation to the main distributing-circuit, and a motor for driving said auxiliary machine having its armature connected across the main distributing-circuit and having a shunt field-magnet winding and an opposing series winding, the magnetic circuit of the motor being saturated under no-load conditions.

819,779. OSCILLAPHONE; Walter W. Massie, Providence, R. I. App. filed Aug. 18, 1905. A conducting pencil bridges across a pair of carbon plates or terminals, and in a magnetic field produced by a permanent magnet in the base plate.

819,787. CONTROLLER FOR SYNCHRONIZING SWITCHES; Hugh J. McMahan, Monessen, Pa. App. filed Apr. 10, 1905. A two-armed lever has spring connected cores for a pair of solenoid magnets in the branches of the different generator circuits. Said lever controls a switch lever which connects the generators into circuit at the proper instant.

819,793. ELECTRIC INCANDESCENT LAMP; William J. Phelps, Detroit, Mich. App. filed June 1, 1903. Detail construction of electric lamp having a normal candle power and a dim candle power filament. A spring plate is disposed over the usual central stud of the lamp so as to cut out the low candle power filament when the lamp is screwed tightly in place.

819,804. COMBINED SASH-LOCK AND BURGLAR ALARM; James B. Ridge, Brooklyn, N. Y. App. filed May 20, 1905. An attachment for an ordinary window sash having a spring detent roller, the displacement of which when the window is opened causes an alarm bell to ring. The attachment also has a locking bolt to prevent the window being open when desired.

819,806. ELECTRIC BLOCK SIGNAL FOR RAILWAYS; Walter E. Sands, Brooklyn, N. Y. App. filed Mar. 18, 1905. A block signal system specially adapted for pleasure railroads. Includes a special conductor or trolley divided into sections and a brush or shoe depending from the cars which makes contact therewith to close certain signal circuits within the car.

819,814. INITIATION APPARATUS; John M. Siebert, Pekin, Ill. App. filed July 24, 1905. An initiation apparatus having specially constructed shoes with conducting soles, and conducting strips for completing a circuit from the induction coil to the shoes.

819,815. ELECTRIC REGENERATOR; Joel C. Slaughter, Dallas, Tex. App. filed July 28, 1902. An electric generator comprising two or more induction coils, and a condenser; the delivery ends of the primary wires of said induction coils being connected to the ends of the secondary coils, and the other ends of the primary coils adapted to be electrically connected to an alternating-current generator, and the other ends of the wire forming the secondary coils, being in electrical connection with the condensing-plates of the condenser, substantially as described.

819,816. SYSTEM OF MOTOR CONTROL; Harve R. Stuart, Wilkinsburg, Pa. App. filed Jan. 20, 1904. A rheostat arm moves over circularly arranged contacts so as to cut in and out controlling resistance for the motor. The rheostat arm is moved by worm upon the shaft of the controlling or pilot motor.

819,820. VENTILATING MEANS FOR INCLOSED MACHINES; Egbert M. Tingley, Pittsburg, Pa. App. filed Mar. 17, 1905. A system for ventilating enclosed generators and motors to prevent access of moisture laden air from the engine room, etc. Has chambers in which the air circulates before its passage into the motor.

819,821. ELECTRIC SWITCH; Allen A. Tirrill, Schenectady, N. Y. App. filed Dec. 11, 1902. A form of snap switch adapted to be secured to the ceiling and having means for indicating the condition of the switch relative to the respective circuits. For this purpose the switch has an indicator projecting through the cover so as to show the position of the switch.

819,822. SNAP ELECTRIC SWITCH; Allen A. Tirrill, Schenectady, N. Y. App. filed Sept. 26, 1904. Another form of snap switch designed to be placed on a ceiling and operated by a depending cord or chain. Relates to details of the operating spring and detents.

819,832. SYSTEM OF ELECTRICAL DISTRIBUTION; Joseph L. Woodbridge, Philadelphia, Pa. App. filed Apr. 19, 1905. The combination of alternating and direct-current circuits having an appropriate converter operatively connected between them, a battery and booster, operatively arranged in respect to the direct-current circuit, a booster-regulator, and solenoids interposed in the generator circuits of the direct and alternating system and operative arranged in respect to the booster regulator, substantially as described.

819,873. BURGLAR ALARM; William N. Fawcett, New York, N. Y. App. filed May 19, 1905. Details of a burglar alarm system including contacts on the various doors of a building so as to give an alarm when any door is moved. Special circuits are provided for indicating which door of the series is the one moved.

819,933. REGULATION OR CONTROL OF DYNAMO ELECTRIC MACHINES OR ELECTRIC MOTORS; Charles P. E. Schneider, Le Creusot, France. App. filed Oct. 22, 1904. In a dynamo or motor regulator, the combination of an armature, a plurality of field-magnet poles, a plurality of pole extension pieces in rows intermediate said magnet poles and armature, guide means for said extension pieces, and a revoluble supporting frame for each row of said pieces.

819,935. ELECTRIC INCANDESCENT LAMP; Carl Schubel, Vienna, Austria-Hungary. App. filed Sept. 25, 1905. The combination with an incandescent electric lamp having a bulb and leading-in wires; of a bridge at the bottom of the lamp to support the outer wires forming a free space between the end of the lamp and bridge, the joint between the outer wires and the leading-in wires being contained in said free space.

819,971. ELECTRIC MOTOR AND GENERATOR; John F. Beck, Chicago, Ill. App. filed Mar. 2, 1903. The combination with an armature-body provided with a circular series of notches or winding recesses, of a lap-winding arranged upon said armature body and engaging said recesses, said winding consisting of circumferentially-extending relatively short and long coils, each recess being engaged by a plurality of coils, of which the short coils extend therefrom each way to the next circumferentially adjacent recesses while the longer coils extend therefrom each way to other more remote recesses.

820,025. ELECTRIC DENTAL FURNACE; Daniel G. Steinecke, New York, N. Y. App. filed May 23, 1905. In a furnace, a base having electric contacts forming terminals of an electric circuit, standards secured to the base, a casing open at its top between said standards, a metal cylinder resting in the open end of said casing, said cylinder being filled with refractory material, and said refractory material being provided with a central opening, a muffle in said central opening and an electric heating circuit in the walls of said muffle and terminating in electric contacts to complete the circuit with the source of electricity of making electrical connection with the said electric contacts of the base, substantially as described.

820,031. PROCESS OF REDUCING CALCIUM OXID; Thomas L. Wilson, New York, N. Y. App. filed Jan. 28, 1896. The herein-described process of reducing calcium oxid by the action of carbon commingled therewith and the heat generated by an electric arc, which consists in establishing an electric arc between suitable poles, embedding the arc within a charge of calcium oxid and carbon, reducing portions of the charge, accumulating the product into a mass, thereafter employing said mass as one pole of the arc and maintaining the arc as the the mass accumulates by gradually moving one of the poles of the arc, keeping unreduced portions of the charge around the arc, thereby retaining the heat of the arc and concentrating it upon the work to be done, and substantially excluding the air from the zone of reduction and permitting the escape of the gases produced by the reduction.

820,040. BATTERY PLATE; Owen H. Fay, Chicago, Ill. App. filed Aug. 19, 1904. A battery plate comprising end bars, a series of longitudinal bars provided with a series of rearwardly-flaring grooves, and a series of strips extending across the opposite faces of the plate, and in staggered relation to each other.

820,041. MEANS FOR ACTUATING SIGNALS; Anthony B. Ferdinand, Milwaukee, Wis. App. filed Sept. 8, 1903. An alarm for indicating when a pneumatic tire is deflated. The tire has a push rod incorporated therein which is moved to close an alarm circuit by contact with the ground when the tire is not fully blown up.

820,047. DRY BATTERY; Charles J. Hirlimann, Fort Lee, N. J. App. filed May 25, 1905. A form of dry battery which can be recharged or renewed as often as desired. The carbon element is hollow with longitudinal slots therein and contains a predetermined quantity of liquid excitant suitable to the needs of the cell. In order to recharge the battery it is merely necessary to remove a stopper and fill the carbon element with reagent and then replace the stopper. The reagent gradually soaks into the absorbent material of the cell.

820,063. SELECTIVE TELEPHONE SYSTEM; Noble S. McKinsey and Anton R. Nelson, Susanville, Cal. App. filed June 15, 1904. A selective telephone system comprising a series of telephones, two line wires, one connected to the ground, a resistance therein to kill the ground when the metallic talking circuit is closed, bridges between the line-wires at the respective telephones of the system, means in each bridge for controlling its telephone, and means at each telephone for connecting the other line-wire with the ground, whereby all the bridges are placed in multiple on a circuit through the line wires and ground, substantially as described.

820,064. SELECTIVE TELEPHONE; Noble S. McKinsey and Anton R. Nelson, Susanville, Cal. App. filed Dec. 27, 1904. In a selective telephone system, a party line of which one wire grounds at central, a resistance therein at central greater than that of any talking circuit in the system, means for connecting at central the other wire of said line with the corresponding wire of any other party-line of the system, selector-magnets at each station bridging the wire of the party-line, and means at each station for grounding said other wire, substantially as described.

820,076. PANEL SWITCH AND CUT-OUT; John H. Trumbull, Plainville, Conn. App. filed May 25, 1904. Details of a cut-out having a manually operated circuit breaker and an automatic circuit breaker included on the same panel. Relates particularly to the details of construction.

820,090. MINE GATE; Newton K. Bowman, North Lawrence, O. App. filed Mar. 10, 1905. A gate is provided across the track at the entrance to a mine which gate is normally closed by spring connections. As the car approaches it depresses certain mechanical connections which displace the gate and provide a continuous trolley conductor for the car.

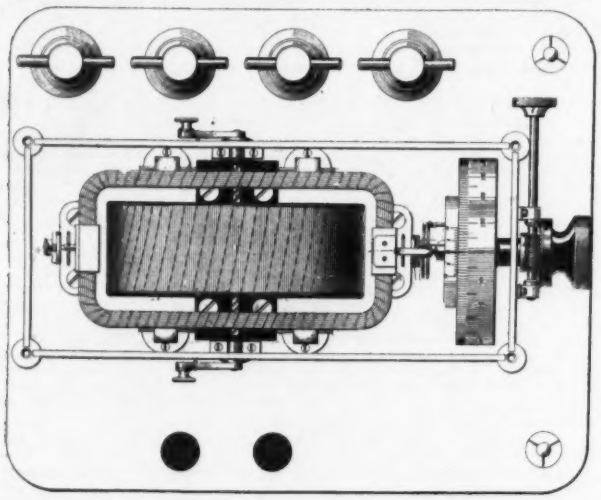
820,113. WATER PURIFIER; Frank B. Hinkson, New Castle, Pa. App. filed May 31, 1905. The water is made to pass through a restricted space between electrically charged plates concentrically arranged, by which the water is purified and sterilized.

820,119. AUTOMATIC ELECTRIC CIRCUIT CHANGER OR SWITCH; Frederick T. Kitt, Denver, Col. App. filed Feb. 15, 1904. A solenoid has a vertically movable core carrying a switch blade and having cam means by which the switch blade turns through 90 deg. at each actuation and thereby completes one of two separate circuits alternately.

820,143. RAILWAY SIGNALING AND SAFETY SYSTEM AND APPARATUS; Georges M. Schreiber, Roubaix, France. App. filed Nov. 15, 1904. A complete railroad signal system having contact connections along the track for automatically blowing the whistle of the locomotive in case it passes a danger signal.

820,169. RESONANCE CIRCUIT; Georg von Arco, Berlin, Germany. App. filed Oct. 4, 1905. A resonance circuit containing a conductor consisting of a stranded wire composed of a plurality of insulated strands the conductive material of each strand being .2 millimeter or less in diameter, substantially as described.

820,176. TELEPHONE SYSTEM; Charles L. Boyce, Detroit, Mich. App. filed Mar. 7, 1902. The combination in a telephone central-station switchboard apparatus, of a line-relay in a main telephone-circuit; a supervisory signal associated with a switch-cord; a local supervisory circuit containing said signal; an auxiliary relay with a winding of high resistance also included in said local supervisory circuit to reduce the strength of current therein and prevent the operation of said signal; and a shunt or short circuit round a portion of said high resistance winding leading through contacts of said line-relay, and controlled by said line relay, to cut out said portion, and prevent the display of said supervisory signal when said relay is unexcited, and to leave said



819,706.—Electrical Measuring Instrument.

portion in said circuit, when the same is excited; substantially as described.

820,186. DEVICE FOR COVERING AND PROTECTING CHARGED RAILS; Gustave Egenolf, New York, N. Y. App. filed Nov. 25, 1904. A form of housing for third rail contacts having a V-shaped roof which is hinged so as to move over the rail and in protecting relation therewith under normal conditions, but which can be folded back to inspect or repair the rail when desired.

820,187. AUTOMATIC EXCHANGE SELECTOR; Claude D. Enoches, La Crosse, Wis. App. filed Oct. 16, 1905. In a selector for an automatic telephone-exchange, the combination with a rotatably-mounted ratchet wheel, of a stepping pawl, and a retaining-pawl for controlling the rotation of said wheel, and an electromagnet having a quick-acting armature and an armature possessing considerable inertia for controlling the operation of said pawls.

820,211. ELECTRICAL CONNECTION FOR SWITCHBOARDS; Hubert Krantz, Brooklyn, N. Y. App. filed July 21, 1903. The terminal is made with a conical stud and the connection has a correspondingly coned recess which is engaged upon the stud by a machine screw so as to be forced into firm engagement therewith.

820,238. EXPLOSION TURBINE; Augustus L. Moss, Sandusky, O. App. filed Mar. 17, 1905. A diagram of circuits for causing break spark ignition in a plurality of cylinders which form pressure reservoirs for driving the turbine wheel.

820,258. DETECTOR FOR ELECTROMAGNETIC WAVES OR THE LIKE; Ragnar H. Rendahl, Berlin, Germany. App. filed Apr. 18, 1905. In apparatus of the character described, the combination with an electrolytic detector, of means for varying the non-energy-consuming property or factor of said detector independently of the energy consuming properties thereof.

820,260. ELECTRICAL SWITCH INDICATOR; William A. Rideout, Sr., Oshkosh, Wis. App. filed Dec. 11, 1905. The movements of the switch point are effective to close separate circuits through a pair of magnets. The magnets are effective to move a semaphore arm or exhibit signal lamps at a station in the path of the train.

820,280. TROLLEY STAND; Warren W. Annable, Grand Rapids, Mich. App. filed Jan. 31, 1905. A trolley pole retrieving device which is only operative in case the trolley pole is about to strike a guy wire. A wire is stretched in front of the pole when the latter leaves the trolley conductor, and if this wire encounters an obstruction it moves a trip which lowers the pole.

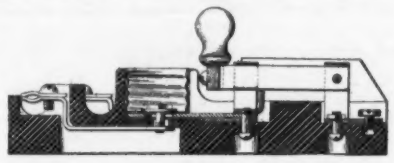
820,282. ELECTRICAL WATER HEATER; William A. Brown, Oakland, Cal. App. filed Apr. 6, 1905. The resistance element is supported within a perforated casing through which the water circulates. The resistance element is ribbed or corrugated for the purpose of having its heat more efficiently conducted to the water.

820,321. OUTLET OR JUNCTION BOX; Clarence C. Sibley, Perth Amboy, N. J. App. filed Dec. 21, 1903. A form of junction box adapted to receive mouldings which are specially formed of sheet metal. The parts are arranged to be fastened together by metallic ears on the sheet metal mouldings.

820,322. ELBOW FOR CONDUITS FOR ELECTRIC WIRES; Clarence C. Sibley, Perth Amboy, N. J., and George A. Lutz, New York, N. Y. App. filed Oct. 23, 1905. Relates to sheet metal mouldings and particularly to an elbow or corner connection therefor which can be bent to varying angles.

820,327. SEWING MACHINE MOTOR; Harold R. Wellman, Riverside, Ill. App. filed Aug. 17, 1905. The entire motor is swiveled on trunnions and has a pulley or driving disc with a curved face concentric with said trunnions. By this arrangement the motor is effective at various angular positions upon its trunnion supports. The transmission speed varying according to the angle.

820,331. REVERSING SWITCH; John N. Anderson, New York, N. Y. App. filed June 23, 1905. A reversing switch for elevators including



820,076.—Panel Switch and Cut-out.

a single controller shaft having blades secured thereto by special insulated fastenings, and cooperating with stationary contacts.

820,333. ELECTRICITY METER FOR ALTERNATING CURRENTS; Hermann Aron, Charlottenburg, Germany. App. filed May 27, 1904. Has the ordinary disc element and an electromagnet with shunt coils thereon. A small series coil is arranged between the poles of the electromagnet. The momentum imparted by this rotative field to the disc is proportional to the energy.

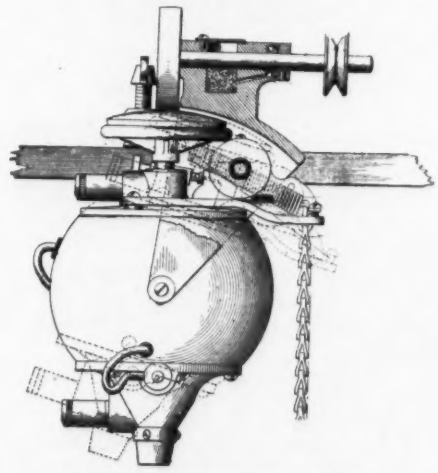
820,348. VAPOR ELECTRIC APPARATUS; William R. Burrows, Newark, N. J. App. filed Mar. 10, 1905. A frangible vessel having a leading-in conductor, said conductor consisting in part of platinum embedded in the wall of said vessel, said conductor having another part consisting of non-amalgamating metal, and a body of mercury surrounding said last-named part and contacting therewith.

820,350. SIGNALING SYSTEM FOR TELEPHONE TRUNK LINES; Merritt S. Conner, Chicago, Ill. App. filed Apr. 9, 1900. The combination with telephone-lines and a trunk-line for uniting them, of a signal in the trunk-line and a source of current in a bridge thereof at one terminal station; a repeating coil at the other terminal, said trunk-line being severed and having its severed terminals united through the windings of the repeating coil to form two conductively separated but inductively-continuous circuits, and a high-resistance signal-controlling magnet in the portion of the trunk-line leading to the first-named office, the said resistance being sufficient to prevent the operation of the signal in the circuit therewith; a source of current and a relay magnet in the other portion of the trunk-line adapted for connection with the called line, and a shunt of the high-resistance signaling-controlling magnet controlled by said relay, as described.

820,360. MULTIPLE SWITCHBOARD FOR TELEPHONE EXCHANGES; Milo G. Kellogg, Chicago, Ill. App. filed Feb. 13, 1892. In a telephone exchange system, two metallic circuit lines, each permanently closed at the central office through the helices of a polarized call-annunciator and the two lines temporarily switched together for conversion into a single metallic circuit with the annunciators connected so as to respond to the same polarity of current, in combination with a clearing-out annunciator in a bridge or cross connection to said metallic circuit and responding to a current of the other polarity, calling and commutator apparatus at each subscribers' station to send at will calling currents of either polarity, and an operator's cord system including plugs and a calling generator adapted to send to line a current of such polarity only as not to operate the line-annunciators, substantially as set forth.

820,363. CONDENSER; Walter W. Massie, Providence, R. I. App. filed Mar. 2, 1905. A form of condenser having plates with tin foil coatings and slidable rods by which any desired number of the plates may be cut into or out of the condenser.

820,364. VACUUM TUBE REGULATOR; Daniel McF. Moore, Newark,



820,327.—Sewing Machine Motor.

N. J. App. filed Aug. 21, 1905. A device for maintaining the vacuum constant in vacuum tube illumination systems. An air inlet through a porous plug of carbon is normally sealed by mercury, but the mercury is displaced by the armature of a magnet when the circuit conditions require a less vacuum.

820,365. VACUUM TUBE REGULATOR; Daniel McF. Moore, Newark, N. J. App. filed Feb. 7, 1906. Covers the method of the above described apparatus.

12,480. PUSH BUTTON ELECTRIC SWITCH; William C. Tregoning, Hackensack, N. J. App. filed Apr. 16, 1906. A snap switch having two switch elements and a pair of push buttons which tension a spring, to move the switch elements abruptly to open the circuit.